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The study examined associations between rural interschool district expenditure allocations and high school student achievement, after accounting for socioeconomic factors. Both cross-sectional and time series per-student expenditure data (1982-1988) were used. Eleven performance criteria were evaluated based on 1985-1988 data. The sample included 27 small Central and Eastern Oregon school districts, enrollment ranging from 60 to about 400 students (grades 1-12). In addition, parents were surveyed to determine their opinions on education success criteria.

Low student-teacher ratio was strongly associated with performance, whereas enrollment was slightly positive. Of the expenditure variables, per-student expenditures on both teacher salaries and noncertified instructional staff were negatively related to education success; whereas, funds allocated to

guidance, health, and counselling and to special instruction for educationally different students were positively associated with performance.

Parent opinions, expressed as a parent success index, strongly affected the analysis results, indicating that parent input is important for greater allocative efficiency of public education funds. However, using hours of adult education as a proxy variable, no association was found between parents' modeling of "lifelong learning" and high school student achievement.

Size economies were found within the sample enrollment range, with per-student expenditures on salaries, benefits, operation/maintenance, administration, and student transportation accounting for over 90 percent of the size effect. However, given the strongly negative association between high student-teacher ratios and education success, rural school consolidation policy would have to consider maintaining a low student-teacher ratio, losing some of the expected efficiency gains.

The Relationship Among Community Commitment to Education, Resource Allocation and Education Success in Rural Oregon

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The Relationship Among Community Commitment to Education, Resource Allocation and Education Success in Rural Oregon

INTRODUCTION

Factors impacting student achievement in school settings have long been of interest to social scientists. French sociologist Emile Durkheim (1858-1917) is credited with first connecting the form and content of schools back to the structure of societies in which they were rooted. It was only logical to take this several steps further by studying student, school and environmental characteristics in various societal contexts and in relationship to educational outcomes. Two broad analytical approaches emerged, eventually engaging a wide range of disciplines, with economists being the most recent players on the field. The first approach could be called the "chiropractic" emphasis which looks at the skeletal development or school structure as the explanation for variability in student performance. This school-centered focus, which has recently witnessed revival in scholarly circles, is generally associated with adherents to the theories of Max Weber and Karl Marx (Dougherty and Hammack, 1988). Equality in terms of educational opportunities is stressed, although Ogbu (1979) cautions researchers with this orientation that they must continually distinguish their role as social scientists from their role as social reformers. The "school resources" arguments were at least temporarily shattered by the widely read Coleman Report (1966), which found level of school funding to have little impact on educational attainment or achievement.

This struck to the core of the equality debate, and, by implication, placed school structure theories in a tenuous position. However, some school-centered theorists were not dismayed by the new quantitative research discoveries. Bowles and Gintis (1976) pointed out that schools by themselves cannot eliminate educational inequality, for it arises in good part from economic and political inequalities in the larger society. However, subsequent empirical studies by Jencks (1972) and others, reviewed by Hanushek (1986), found no overall promise for improving education by increased expenditures. These findings added impetus to the second approach, more closely identified with the functionalists' position. Unlike the chiropractic view, this alternative diagnosis of education begins with the "vital organs" or major players. Here student-centered explanations, which include family characteristics, are seen as the main determinants of academic performance. Back-to-the-basics adherents see educational improvements starting with such student oriented analyses. The value of applying the economic and statistical constructs cited earlier lies in their potential ability to simultaneously analyze both school-centered and student-centered explanations of student outcomes. Distinct from other social science research paradigms, economic theory can be viewed as an abstract methodological engine, stripped of normative assumptions, but applicable to studying a wide range of problems (Friedman, 1962). The danger of such studies, particularly the attempts at correlating social and psychological variables with school expenditures, is the temptation to draw conclusions about causality in educational processes that are highly suspect. Yet the courts of the land have accepted econometric interpretations in directing major policy changes affecting education.

In this study, an attempt was made to broaden existing scholarship on factors affecting student outcomes. School-centered variables were studied in terms of variations in interschool district resource allocations. This is not new, apart from the target population studied, which was drawn from remote rural areas in Oregon. Student-centered variables were not measured directly. Instead, after accounting for known family influences, a link between community commitment to education and education success was investigated. Using Cremin's definition of education, modified by Darkenwald and Merriam (1982), as the deliberate, systematic and sustained effort to transmit, evoke, or acquire knowledge, attitudes, values, or skills, as well as any outcomes of that effort, it is possible, at least theoretically, to measure a community's commitment to education by looking beyond traditional pedagogy settings. Apart from the family's role, which has received considerable attention by social scientists, other systematic and deliberate educational efforts are offered through institutions such as the church, workplace, mass media, library, and others generically referred to as "community education" (Darkenwald and Merriam, 1982). Education in the workplace is actually gaining ground because it seems to have a more durable influence on earnings than learning in schools (Carnevale, 1989). Although not all such non-traditional educational venues were investigated in this study (the lack of uniform data being a main constraint), an attempt was made to probe this largely unexplored domain as it affects traditional schooling. The underlying hypothesis for this broader focus associates desirable education outcomes of children with an overall strong commitment of the community, young and old, to what has been called "lifelong learning." Studies on high school dropouts lends encouragement to this approach. Wehlage and Rutter (1986) concluded that community-based educational programs and other alternatives to public schools for school-aged children can be expected to reduce the number of dropouts. The possibility of a synergistic relation between non-traditional educational services and traditional schooling as it impacts education success is appealing. If true, it may help explain some of the unknowns and conflicting results in resource allocation studies described in the literature.

Before embarking on a more exhaustive review of the literature dealing with variables affecting education, it is necessary to define the term education success. A differentiation must first be made between adult success and education success. Adult success, not investigated in this study, refers to the relationship between educational attainment and job status or earnings. Education success, as defined here, refers to both achievement and attainment as the end result, although the positive link between education attainment and adult success is well-documented (The Condition of Education, 1989). Most studies on education success rely on standardized achievement scores as the dependent variable or outcome measure. Philosophically, this limited view has major weaknesses. Jefferson's position on success or education excellence was to be measured by the contribution of the educational process to the child's developing autonomy (cited in Coons, 1978). Another perspective was offered by Albion Small, a pioneer in the field of sociology. He defined education success in light of his overarching functionalist philosophy, in which the public school was seen as the vanguard of the movement to improve society. He saw success "only in the record of men and women who go from the school eager to explore wider and deeper these social relations, and zealous to do their part in making a better future" (Cremin, 1964). Holmes (1975) similarly defined the mark of an educated person as one who continues to read, to learn, to grow, realizing that however large the circumference of the knowledge gained, just as large are the borders of ignorance. Here the link between education of children and lifelong learning is made very explicit. In other words, excellence in education implies that a continuing desire for further learning has been instilled in the student through successful elementary and secondary education. This notion of success, or the desire to obtain more education, was employed in this study, along with achievement measures. Specifically, quantitative analyses were conducted, with postsecondary enrollments, high school retention rates, and high school standardized achievement scores as the dependent variables. School resources and community commitment to education were the hypothesized explanatory variables.

As noted earlier, rural Oregon was selected as the target area for this investigation. Several reasons are offered to justify this approach. First, the author's work and research emphasis to-date has been concerned mainly with rural issues. Further, given the strong link between education and training with rural development success (Thomas, 1988; Pankratz, 1989), a better understanding of education resource allocation in rural areas has potential practical benefits. Perhaps a more substantive reason for the rural emphasis is based on the report that rural schools appear to differ from urban school groups and also from overall state samples of schools with respect to education expenditure and student outcome relationships (Wendling and Cohen, 1981). More is known about school funding relationships for urban schools than for rural schools. Yet, according to Nachtigal (1990), three-fourths of America's school districts are rural, enrolling approximately one-third of the nation's school children. He contends that in the emerging information age, rural schools could lead the way in the restructuring of education. This speculation is based on the fact that most rural schools offer a general curriculum, in contrast to the more specialized curriculum characterizing urban schools. Finally, probing new territory, which was being attempted in this study, would be facilitated by avoiding urban jurisdictions. Given a suspected relative homogeneity and stability of populations in many parts of rural Oregon, it was expected that data collection would be easier in rural areas.

The purpose of this study was to reevaluate the reported findings that community commitment to education and resource allocation have little impact on education success, with a specific focus on financial management issues in rural areas. By including a parent survey on what constitutes education success, a composite success index was developed to more accurately reflect community education objectives, thereby permitting a new look at the hypothesis that expenditure variables are predictors of high school achievement. Previous studies evaluated student performance only with individual success criteria such as test scores. Also, an attempt was made to study parents' modeling of learning, using hours of adult education as a proxy variable, as it relates to high school student performance. Finally, given the general lack of knowledge about rural schools, the study examined the hypothesis that these schools exhibit unique per pupil expenditures, socioeconomic characteristics, and student performance relationships. It was expected that the results of this study would provide insights into policy matters such as school consolidations and planning for more effective use of public education funds in rural areas.

LITERATURE REVIEW

Although this study was concerned primarily with resource allocation and community commitment as they relate to education success, socioeconomic and demographic interactive variables, as well as relevant teacher and student characteristics, could not be overlooked. MacPhail-Wilcox and King (1986) reported considerable difficulty in isolating the influence of resource allocation and practices on student and school productivity without controlling for environmental conditions and student attributes. Therefore, this chapter begins with a representative, but not exhaustive, review of recent studies dealing with the impact of known variables on education success. Then, a more detailed survey of resource allocation and production function literature and related conceptual issues as it applies to education is presented.

Education Success Explanatory Variables

Student, Parent, and Environmental Characteristics

Student characteristics. Intelligence levels or innate ability, generally measured indirectly through intelligence quotient (IQ) or other standardized tests, can be expected to influence achievement scores. Wolfle (1985) concluded that the single most important determinant of placement in an academic program and subsequent educational attainment, whether the student is white or black, is the ability of the student. Multiple regression techniques employed by Summers and Wolfe (1977), which included 29 explanatory variables affecting sixth-grade achievement, showed IQ to have consistent positive coefficients and the highest t-values. Nuttall et al. (1976) concluded that IQ is strongly related with grade point average for both boys and girls. Using the production function approach, Bieker and Anschel (1973) found that the statistical significance of derived coefficients for student ability was curricula driven. Coefficients in the equations for general and vocational curricula were significant, while those for the academic curriculum were not. It was hypothesized that the academic curriculum was designed for the average student and that superior students were unable to capitalize on their innate ability. Whalen and Fried (1973), while studying student mobility, found a highly significant relationship between IQ and achievement. Although no direct influence of student geographic mobility was detected, an interactive effect between mobility and IQ was found, with high IQ students benefitting from frequent moves and low IQ students suffering academically from mobility.

Studies on student values indicate that, apart from IQ, values are an important factor in student achievement. The development of responsibility and hard work patterns and orientation to adult values have been observed in higher achieving children (Nuttall et al., 1976). Hanson and Ginsburg (1988) found that students holding values that stress the notion of responsibility have a better chance of achieving success in high school. In comparison to indirect variables, the effect of values as a whole, including values of students, parents and peers, was found to be consistently larger than the effect of socioeconomic status (SES) when predicting both the level of student performance and changes in student performance. In a related qualitative research study by

Schwartz (1981), peer group influences were found to be linked to inschool tracking or hierarchical placement of students on the basis of ability. This finding leads to the argument that although peer group influence is considered a student-centered explanation, its effect on education success is influenced more by the institutional framework of the school, over which the student has little control. Specifically, high-track peer groups appear to endorse academic activity, whereas low-track social ties hinder and subvert participation in classwork.

Parent and environmental characteristics. Parent characteristics are generally linked with area variables and SES, since such data are seldom collected at the micro level, limiting the type of inferences that can be made about parental influences on student achievement. In an Israeli student level study (Biniaminov and Glasman, 1983), family SES differences or level of disadvantaged students were found to be negatively associated with rates of graduate certifications. Rumberger (1983) found that students with a lower social class background are much more likely to leave school prematurely than students from higher social origins. Citing 1987 U.S. Department of Education data, Dougherty and Hammack (1988) reported that high school graduates who are in the top quartile in SES are nearly twice as likely to go on to college as those who are in the bottom quartile.

As noted earlier, parent values and social class have been shown to have a direct effect on school outcomes. Parents of children who score high on math achievement tests place a high value on education and express concern over their children's activities and well-being (Hanson and Ginsburg, 1988).

Father's occupation is considered to influence scholastic aptitude test (SAT) scores beyond SES factors. Specifically, children with fathers in cultural occupations, which include the transmission of heritage such as education and journalism, were found to have the highest mean verbal scores, and children with fathers in science occupations were found to score high both on the verbal and quantitative scales. Also, father's absence was associated with significantly lower quantitative scores for both boys and girls (Belz and Geary, 1984).

Mother's education is also important. Murname et al. (1980) found strong support for the hypothesis that high school completion by mothers was an important factor in helping children acquire cognitive skills.

Family constellation variables such as family size, birth order, spacing of children, and crowding have not escaped analytical scrutiny. Controlling for IQ, Nuttall et al. (1976) found that small family boys tended to have better grades than did large family boys. Also, first-born girls had higher academic achievement than did later-born girls. Crowding and spacing did not provide significant correlations.

Results of studies dealing with area SES and its relation to achievement are conflicting. Wendling and Cohen (1981) found strong negative associations with percent of the population below the poverty line in statewide comparisons, but poverty exhibited no effect in rural schools. Based on a survey of 147 economic-oriented studies through 1985, primarily dealing with area cross-sectional data, Hanushek (1986) concluded that SES or family background is the likely direct causal agent in observed student performance differences, even though simple correlations between school expenditures and achievement were found. This appears to be a revival of the cultural deprivation theories which were advanced in the mid-1960s. Deutsch's (1963) work is a classic example of studies linking deficiencies in student's skills and attitudes to the family's frequent poverty and unemployment.

Race and sex as predictors of educational attainment are well-documented. Dougherty and Hammack (1988), citing 1987 U.S. Department of Education data, showed wide racial differences in percent of 18 to 24 year olds in college. Whites represented the largest cohort, followed by African Americans and then Hispanics. Differences attributed to sex were not evidenced. Looking at percent minority as a school characteristic, Wendling and Cohen (1981) reported strong associations between achievement and minority concentration in New York State. Based on third- and sixth-grade reading and mathematics score comparisons, high percent minority students was found to be a negative factor, particularly in urban and statewide areas. Although significant, minority concentration in rural areas impacted scores less. Sebold and Dato (1981) reported similar results based on school district level data in California. Overall, however, social class is considered a stronger predictor of education success than race (Rumberger, 1983; Wolfle, 1985; Dougherty and Hammack, 1988). Wolfle (1985) reported that increments in background social status variables lead to similar educational attainment for whites and blacks. A possible explanation for the social class and minority concentration interaction, according to Dougherty and Hammack (1988), is that working class and minority students develop powerful norms against academic success. Ogbu (1979) offered an alternative view based on observed racial differences that reflect socialization of children by black parents has a different goal than socialization by white parents.

An area that will become of increasing importance in the United States concerns the multicultural education movement and the related bilingual education debate. This movement grew out of the ferment of the civil rights movement of the 1960s and has as its major goal "to change the structure of educational institutions so that male and female students, exceptional students, and students who are members of diverse racial, ethnic, and cultural groups will have an equal chance to achieve academically in school" (Banks and Banks, 1989). This stated objective implies that the changing demographics of the United States, particularly the influx of large cohorts of Hispanic and Asian students into the school system, will likely introduce new variables into the education success equation. This is put into perspective by Ovando (1989), who reported that offering bilingual instruction to limited-English-proficient students, particularly in the early primary years, can provide a base for skills development that is comprehensible to such students and can then be applied to their academic and language growth in English. Although it is known that prior acquired knowledge and skills in the home language transfer automatically to the new language, much research is needed in this emerging facet of the

U.S. school scene. Cultural variables other than language are also receiving a fresh look in relation to their impact on excellence in education. Offering both academic and cultural instruction, the development of Tribal Colleges for Native Americans appears to be successful, with enrollment now numbering about 12,000 students (McDonald, 1990).

Teacher and School Characteristics

Teacher characteristics. Teacher characteristics cited in the literature include average teacher experience, percent first year teachers, percent teachers with graduate degrees, teacher turnover rates, and length of tenure. Percent expenditures on teacher salaries are often intertwined with these variables, as will be discussed later in this chapter. Wendling and Cohen (1981) demonstrated that differences in teachers are important in elementary school achievement, with average experience being the most important positive associative variable in this category. Percent teachers with advanced degrees was found to have a nondetectable to a small positive association. Similarly, King et al. (1989) found little correlation between percent first-year teachers or teachers with advanced degrees and achievement in elementary and middle schools. The study by Biniaminov and Glasman (1983) showed teacher's length of tenure to be a positive and direct predictor of high school achievement. Qualitative research in this area suggests that positive interaction between teacher and principal and a critical mass of other teacher "personality" factors that are difficult to quantify explain much of the unaccounted differences in student outcomes (Dougherty and Hammack, 1988).

School characteristics. School characteristics associated with student achievement include size and expenditure related variables such as pupil-teacher ratios. School size studies by Wendling and Cohen (1981) showed rural and urban differences, with increasing school size being negatively associated with achievement in urban areas, but negligible or slightly positively associated in rural schools. Conflicting results were reported on student-teacher ratio. Wendling and Cohen (1981) reported positive associations with high pupil-teacher ratios and achievement, most strongly demonstrated in urban schools. Similar statewide studies by King et al. (1989) in North Carolina, however, found high pupil-teacher ratios to be negatively associated with achievement.

Resource Allocation in Education

As an introduction to resource allocation studies, a differentiation must be made between allocative and production efficiency. Allocative efficiency in the production of goods and services is defined by economists in the context of satisfying consumers' wants and needs (McConnell, 1987). An initial distribution of incomes and wealth is assumed with no normative overtones. Consumer demand for, and society supply of, education is the starting point for this methodological paradigm. Further, allocative efficiency invokes the notion of opportunity cost, equating sacrifices and benefits. This is not the same as production or technical efficiency or the goal of minimizing the cost of production given the desired level of educational services. When there is a high level of allocative efficiency, opportunity costs are minimized, suggesting that consumers are receiving what they bargained for in terms of educational outcomes. This could include wide choice of courses, high general achievement scores, low dropout rates and increasing percentages of high school graduates seeking higher education.

Resource allocation studies in education are designed to identify how differences in funding detract from or enhance the attainment of particular learning conditions and educational outcomes (MacPhail-Wilcox and King, 1986). What makes this fertile ground for quantitative research is that school funding is not equal between states, districts and schools in most parts of the United States, leading to the belief that students in poor areas are being treated unfairly.

According to Weber (1989), Oregon, which ranks 14th in the nation in current spending per pupil as well as in pupil-teacher ratio, is a classic example of inequality in school spending. In 1987-88 per pupil spending ranged from $2,241 to $19,461 between school districts. This variation is attributed to Oregon's heavy dependence on local revenues for funding education. In recent years, 67 percent of school finances have come from local property taxes (fourth highest level in the nation), 27 percent from state revenues, and 6 percent from federal revenues. Criticism of the current funding system centers on the spending inequality likely resulting in inadequate basic education for many students. The state's equalization effort is reported by Weber (1989) to be too small, relative to the differences in actual spending, to make a difference. Supporters of Oregon's education finance system cite local control in financial and program matters as justification for the disparities. "Oregon's tradition of local control supports two key ideas: Taxpayers should have a say in determining local service levels, and those who are willing to pay more should receive more" (Weber, 1989).

A more philosophical question on the issue of equality is: "Can education be equal and excellent?" (Coons, 1978). Guthrie et al. (1988) answered that Americans through their culture hold three strongly preferred values that impact education policy: equality, efficiency, and liberty. However, "despite widespread popular devotion to these values as abstract goals, their simultaneous fulfillment is well nigh impossible...[because] exclusive pursuit of one violates or eliminates the others" (Guthrie et al., 1988).

Spurred by the equal protection clause of the U.S. Constitution, California's classic lawsuit, Serrano vs. Priest 1967, led to the state ruling that differences in school spending exceeding $100 per pupil could not be wealth-related.

The Serrano vs. Priest ruling revolved around the concept of equality of educational opportunity earlier identified with the "school-centered" adherents. More recently, education equality has come to mean equality of educational outcome or the notion that schools ought to produce students all of whom have the same minimum or basic skills (Guthrie et al., 1988). This democratic ideal stressing equality of educational attainment is challenged by Brown and Saks

(1975), who argue that the preferred efficiency goal develops individual differences among students to fit them for a differentiated economy or society.

Research dealing with the education finance issue can be categorized into two broad groupings. First, the factors that may lead to funding differences are analyzed, with property wealth disparities coupled with inadequate financing being cited as the main culprit. Predictors of financial stress impacting school funding have been identified. Second, research attempts to identify allocative efficiency, linking specific expenditures with desired outcomes. This is more an administrative or management perspective. (The latter approach is one of the primary thrusts of the present study.)

Resource allocation and funding availability, however, are not mutually exclusive considerations; therefore, factors that are correlated with fiscal stress need to considered as well. Ward (1985) identified older cities with older housing and cities with low growth in medium family income as prime correlates of fiscal stress and reported that cities having a low proportion of their workforce in trades and a population with low educational attainment tended to exhibit higher fiscal stress. However, the Ward study did not support the claim that urban school districts suffer from financial problems because of large numbers of minority, limited English-speaking, and special education students.

Previous studies on resource allocation in education have largely been macro-level investigations. Micro-investigations, referring to studies on resource flow within classrooms, have not been the traditional domain of economists. The latter approach was preferred by Wendling and Cohen (1981), who claimed that the state of the art of education production functions has moved beyond the earlier aggregate cross-sectional studies and in their place individual student-level analyses allowing for lagged achievement measures should be employed, to study variations in spending and educational resources. However, King et al. (1989) noted that recent improvements in research technologies warrants further macro-level studies. By defining subpopulations of school districts on the basis of need and wealth criteria, more accurate generalizations about resource allocation patterns were reportedly found. In the King et al. study, need was measured by the percentage of students receiving free lunches, a proxy variable. Educational resources, particularly the proportion of professional staff supported by local funds, were found to be significant predictors of achievement in low need school districts, but not in high need districts. It also was found that the lower the educational need, the higher the proportion of teachers with advanced degrees and the higher the percentage of local resources devoted to salaries. This situation was not necessarily wealth-related. Higher school funding effort was found to be exerted in low need districts, regardless of wealth.

Macro-investigations are either interstate, interdistrict, or intradistrict analyses, all of which can be criticized on the basis that they examine expenditures, not educational inputs. Notwithstanding this criticism, given the more readily available expenditure data, courts have generally accepted statistical analyses based on interdistrict comparisons of expenditures as proxies for the services actually delivered to the school children (Hanushek, 1979). As noted earlier, the Coleman Report (1960) set the tone for direct policy interpretation of these studies, with results frequently entering into judicial proceedings, legislative debate, and executive branch policy deliberations. Possibly accounting for this practice is that, on average, district fiscal resources are found to be predictable functions of wealth and demography (MacPhail-Wilcox and King, 1986).

The results of macro-level studies have been discussed in context with environmental variables. Hanushek's (1986) review is particularly useful. There were only two studies providing evidence that school expenditures "make a difference." Sebold and Dato (191), using California data, hypothesized that equalization of funding per student would have a statistically significant effect on test scores. King et al. (1989) reported that certain educational resources were significant predictors of achievement in the school districts they studied.

The conceptual and empirical issues in the estimation of educational production functions (also termed input-output analysis) is another matter. These issues were reviewed by Hanushek (1979) and Brown and Saks (1975). By definition, a production function describes the maximum output possible with different sets of inputs. The notion that operating at the "frontier" would be difficult to prove in the case of education has not deterred researchers. In production function research, a school is thought to be a firm whose output is the mean score of its students on some achievement test (Brown and Saks, 1975). Several problems immediately arise. First, mean student performance measures may not be sensitive to inputs that are indeed productive. Brown and Saks concluded that in generally available data only the interactions of educational technology and tastes (values of school administrators) are observed, with important marginal productivity and distributional biases of inputs going undetected. Second, as Hanushek (1979) noted, there is no homogeneous output in education, as postulated in standard production theory; the school in reality is a multi-product firm.

Hanushek (1979) provided a useful conceptual model of an education production function:

$$A_{it} = f(B_i^{(t)}, P_i^{(t)}, S_i^{(t)}, I_i^{(t)})$$

where for the ith student,

A_{it} = achievement at time t;

$B_i^{(t)}$ = vector of family background influences cumulative to time t;

$P_i^{(t)}$ = vector of influences of peers cumulative to time t;

$S_i^{(t)}$ = vector of influences of school inputs cumulative to time t;

$I_i^{(t)}$ = vector of innate abilities.

This model specification is believed to be appropriate in the abstract; however, in most analyses, proxy measures are used. Proxy measures introduce considerable measurement errors and give little attention to the dynamics of how the effects of different inputs accumulate. The most consistent and obvious divergence from the conceptual model is the lack of measurement for innate abilities (Hanushek, 1979). Many other methodological issues arise, apart from measurement errors. Micro-investigators Bieker and Anschel (1973) concluded that there is no unique response function to describe the relationship between high school and product; each curriculum must be analyzed separately. Their conclusion was based on finding very low r-square values for vocational and general curricula compared to academic curriculum. Also, they found that prices of education resources differed among school districts because the nature of the work and the quality of the living environments varied. Wendling (1981) attempted to compensate for the price factor by developing a cost of education index for measurement of price differences of education personnel among New York State school districts.

Interdependence among exogenous variables is considered by some researchers to be a major analytical problem. In the case of education success explanatory variables, factors such as SES, race, and student attitudes can be expected to be highly correlated. The problem of multicollinearity can have three main consequences: (a) the precision of estimation falls so that it becomes very difficult, if not impossible, to disentangle the relative influences of the various explanatory variables; (b) investigators are led to drop variables incorrectly; and (c) estimates of coefficients become very sensitive to particular sets of sample data, which could result in dramatic shifts in one of the coefficients, including a change in the sign of the coefficients (Johnston, 1960).

Estimates of economic parameters can be improved by use of ridge regression techniques with production function applications. This essentially involves adding a biasing factor to the regression matrix, with the intent of reducing the variance inflation factor of the estimated coefficients that is associated with multicollinearity (Brown and Beattie, 1975). This technique was used by King et al. (1989) in education resource allocation studies, and, in some cases, ridge traces did result in change of sign of the coefficients.

Hanushek (1979) suggested that multicollinearity is probably overrated, noting that multiple regression techniques are used because of the fact there are correlations among the independent variables. Other conceptual issues include improper specification of the functional form, difficulty in the interpretation of aggregated data, and inconsistent application of statistical methods.

METHODOLOGY

Experimental Design

Experimental design planning begins with the specification of manageable data collection and analysis procedures that will permit the overall objectives of the study to be met. As noted in the literature review, there are many hypothesized interacting variables associated with student achievement. A meaningful analysis of these factors, which it is hoped would lead to some policy implementations, is simplified if the economic ceterus paribus condition can be applied to some of the categories explaining education success. The present study attempted such simplification by narrowing down the population to be studied from a broad rural Oregon perspective to an explicit focus on small schools in Central and Eastern Oregon. This choice was largely motivated by the objective of securing data from rural areas that were believed to be relatively homogeneous and stable. Unlike much of Western Oregon, the region east of the Cascade Mountains is sparsely populated, separated by considerable distances from large population centers. Apart from local services, the economy of this "high desert" region is mainly resource based with forestry, agricultural, and recreation enterprises predominating.

The primary thrust of this study dealt with resource allocation, necessitating the collection of reliable expenditure data. Since both expenditure data and socioeconomic data (SES) were available by school district, this became the primary unit of comparison. Ginsberg et al. (1981) showed that a substantial proportion of the variance in staff inputs can be explained by interschool district allocation of resources. In that study, interdistrict variation was found to explain 88 percent in median teacher salary comparisons. Further, intradistrict comparisons showed that local allocation of resources tends to compensate for interdistrict inequities. Weber's (1989) observation that interdistrict resources are strongly influenced by local property wealth, permitting comparisons of expenditure patterns over a wide range of values, also supported the choice of school districts in the present study.

Selection of Sample

The sample initially chosen was all school districts east of the Cascades, with student enrollment around 400 or less, generally including grades 1 to 12. One district was subsequently dropped because it was considered to be atypical since it had the only remaining residential high school in Oregon (Crane Union High in Harney County).

A preliminary analysis of 1989-1990 expenditure and enrollment data of small districts (51 to 414 students) in the study area indicated, in general, that expenditures per student declined as enrollment increased up to around 400 students, thereafter increasing again as size increased. Figure 1 depicts this relationship. Four clusters of school districts by expenditure level are evident. Cluster 1 indicates the smallest schools, those having enrollment under 120 students. Enrollments in Cluster 2 schools ranged from 100 to 180 students and in Cluster 3 were more spread out, with numbers mainly in the 250-400 range. Schools in Cluster 4 had about 500 students, with expenditures per

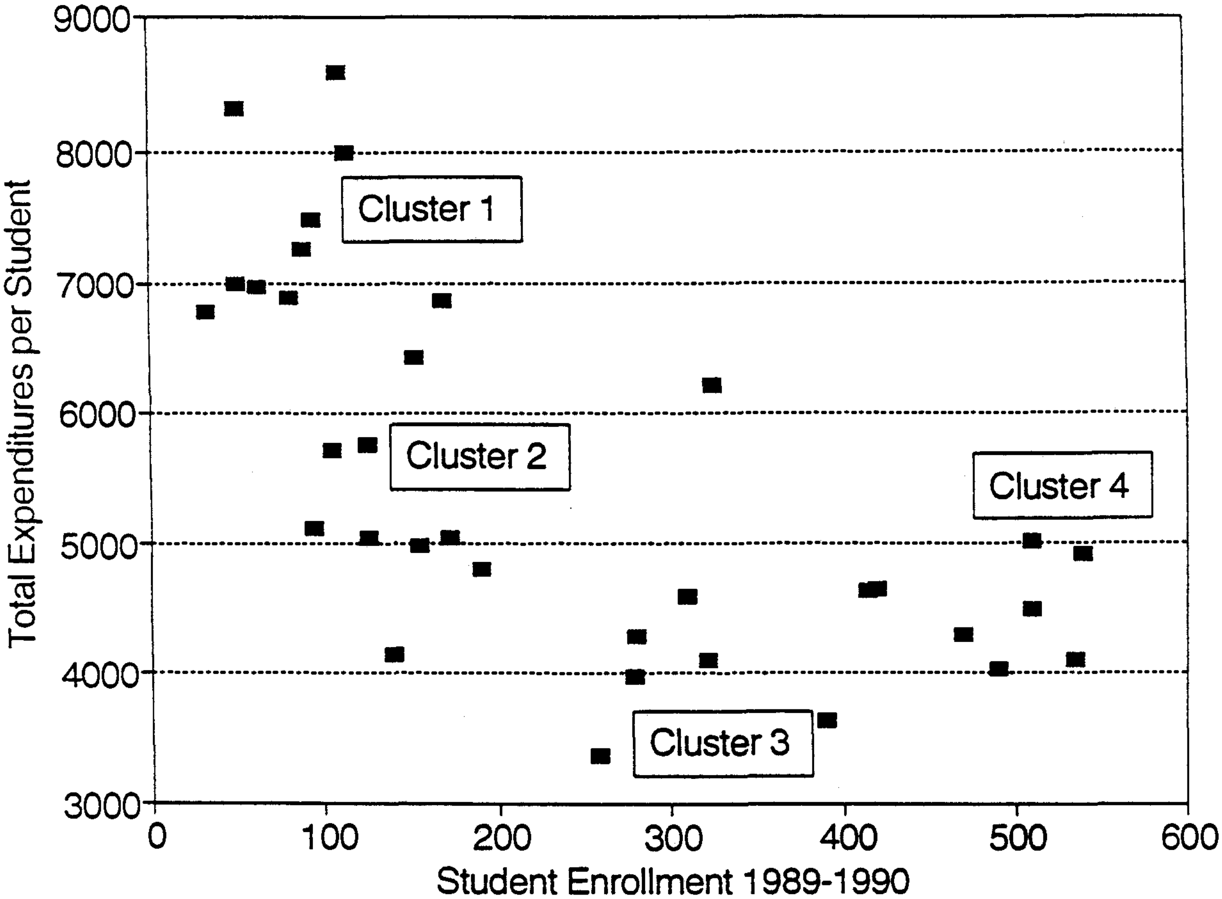

Figure 1. Preliminary analysis of school size and expenditure relationships

student about $750 higher than those in the third cluster. Two school districts, both with enrollments under 400, represented major departures from the general trends. Based on the evidence of these observed preliminary relationships, and referring to the Oregon School Directory 1989-1990, 27 school districts were identified for further study, all with total enrollments of around 400 or less. Of the 27 districts, 24 were comprised of one elementary school and one high school. Two districts (Jordan Valley and Sherman) were strictly high school districts. To make the data for all 27 districts comparable, the elementary school district information within these districts was tabulated along with the high school figures. Location of the selected districts is shown in Figure 2. Table 1 presents preliminary data on the selected school districts, including 1989-90 enrollments, teachers, expenditures, and assessed values. School district composition by elementary and high schools is shown in Table 2.

Data Analysis

The primary analytical tool in this study was multiple regression employing the ordinary least squares model (OLS), regressing education success variables against expenditure and socioeconomic (SES) explanatory variables. The education success variables included standardized test scores, percent graduates enrolling in four-year colleges and universities, and percent annual school retention rates (calculated as 100 minus percent dropouts or early leavers). Table 3 shows the dependent education success variables and data sources.

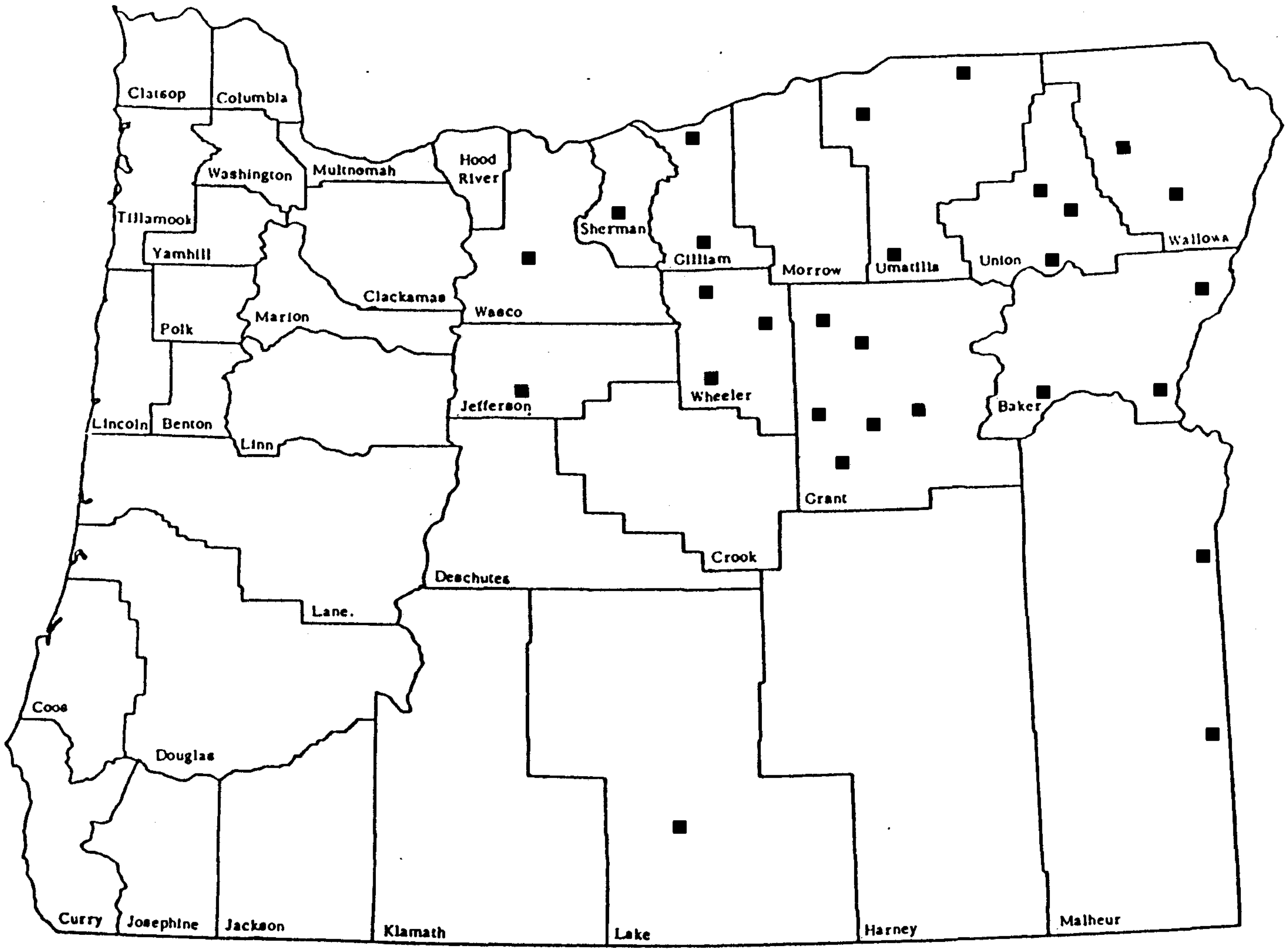

Figure 2. Location of school districts in the study

Table 1. Preliminary data on school districts selected for analysis (1989-90)

County-District	Total School Enrollment	High School Enrollment	Expenditures per Student	Assessed Value per Student
Baker				
Huntington 16J	125.5	38	5,038	233,281
Burnt River 30J	89.0	30	7,256	199,313
Pine Eagle 61	325.5	100	6,209	296,498
Gilliam				
Arlington 3	125.5	35	5,743	424,075
Condon 25J	170.0	49	6,846	279,630
Grant				
Prairie City 4	280.0	70	4,282	158,864
Mt. Vernon 6	173.0	54	5,042	97,158
Monument 8	94.0	32	5,110	129,193
Dayville 16J	62.0	16	6,963	165,274
Long Creek 17	105.0	38	5,705	240,565
Jefferson				
Culver 4	322.0	146	4,097	199,097
Lake				
Paisley 11	110.0	80	8,584	286,864
Malheur				
Jordan Valley 1 & 3	140.0	58	4,140	214,446
Adrian 61	279.0	139	3,978	128,503
Sherman				
Sherman Union 1J &17J	233.0	104	6,763	661,599
Umatilla				
Helix 1	113.5	47	7,993	349,944
Echo 5	153.0	66	6,415	205,417
Ukiah 80	51.0	11	8,313	147,283
Union				
North Powder 8J	155.0	55	4,987	218,652
Imbler 11	391.0	170	3,625	74,257
Cove 15	258.0	75	3,360	92,470
Wallowa				
Joseph 6	414.0	113	4,642	298,183
Wallowa 12	310.0	94	4,597	149,760
Wasco				
Dufur 29	191.0	47	4,801	167,969
Wheeler				
Spray 1	51.0	17	6,995	258,692
Fossil 21J	94.0	38	7,481	178,907
Mitchell 55	81.0	25	6,875	250,974

Table 2. Composition and grades by school district*

County-District	Elementary School Grades	High School Grades
Baker		
Huntington 16J	1-6	7-12
Burnt River 30J	1-6	7-12
Pine Eagle 61	1-8	9-12
Gilliam		
Arlington 3	K-8	9-12
Condon 25J	K-8	9-12
Grant		
Prairie City 4	K-6	7-12
Mt. Vernon 6	K-6	7-12
Monument 8	K-6	7-12
Dayville 16J	1-6	7-12
Long Creek 17	1-8	9-12
Jefferson		
Culver 4	K-5	6-12
Lake		
Paisley 11	K-6	7-12
Malheur		
Jordan Valley 1	1-8	
Jordan Valley 3		9-12
Adrian 61	K-6	7-12
Sherman		
Sherman Union 1J	1-8	
Sherman Union 17J		9-12
Umatilla		
Helix 1	1-8	9-12
Echo 5	K-8	9-12
Ukiah 80	K-8	9-12
Union		
North Powder 8J	1-8	9-12
Imbler 11	K-6	7-12
Cove 15	1-6	7-12
Wallowa		
Joseph 6	1-8	9-12 & 7-8
Wallowa 12	K-6	7-12
Wasco		
Dufur 29	K-8	9-12
Wheeler		
Spray 1	K-6	7-12
Fossil 21J	K-8	9-12
Mitchell 55	1-8	9-12

* 1 elementary and 1 high school per district, except Pine Eagle with 2 elementary schools

Descriptive analysis was employed to present an overview of expenditure patterns, socioeconomic factors, and parent survey responses. Data are portrayed in tables as well as in graphical form (in those cases where a "picture" presents a clearer view of the specific relationship under study.)

The second phase of analysis employed multiple regression techniques to study the relationships among community commitment to education, resource allocation, and education success. Shazam Version 6.0 (White, Haun & Horsman, 1987) was used in these computations.

A major problem anticipated in the data was the existence of multicolinearity between the explanatory variables. To test for this suspected problem, a correlation matrix of all the independent variables was run. A further test of the data with respect to colinearity was provided by calculating the inverse correlation of the independent variables. The logic of using this test stems from the fact that the least squares estimate $B = (X'X)^{-1}X'y$ requires the inversion of $X'X$, which is impossible if all the explanatory variables are perfectly collinear. As Johnston (1960) noted, a less extreme but still very serious case arises when the assumption is only just satisfied. In such a case, the precision of estimation falls so that it becomes very difficult to quantify the true relative influences of the X variables. Using Johnstone's terminology, where alpha (α) equals correlation between X_2 and X_3 (r_{23}),

$$\mathrm{var}\ (B_2) = \mathrm{var}\ (B_3) = \sigma^2\mu/(1 - \alpha^2)$$

and

$$\mathrm{cov}\ (B_2,B_3) = -\ \alpha(\sigma^2\mu)/(1 - \alpha^2)$$

Therefore, as alpha increases, a variance inflation factor becomes increasingly pervasive, resulting in fragile or nonrobust estimates.

Tests for heteroscedasticity also were run, using special analytical features of Shazam Version 6.0 (White et al., 1987).

Data Collection

Data for education success variables Y1, Y2, Y10, and Y11 (Table 3) were collected by personal visits to each school district (accomplished in early summer, 1990). Average SAT scores were kept by only some of the school districts. To calculate percent attending college, number of high school graduates by year were first determined from graduating class pictures hung in the halls of each high school. Then, using Oregon State System of Higher Education (OSSHE) statistics of graduating seniors attending Oregon institutions in the fall of that (graduation) year, the percentages were calculated. No direct data, by school district, were available on Oregon students attending out-of-state institutions. However, students are surveyed by OSSHE in their high school sophomore year regarding college/university intentions, which includes their preferences on location. This information was useful in attempting to see whether some districts send a disproportionate number of students to institutions outside of Oregon.

School retention rates were determined by interviews with respective superintendents and/or principals. For the past two years, Oregon schools

Table 3. Education success variables (dependent variables)

Variable Name	Variable Symbol	Explanation	Data Source
VSATS	Y1	Average verbal SAT score	School district
MSATS	Y2	Average math SAT score	School district
VSATE	Y3	Average verbal SAT score	OSSHE*
MSATE	Y4	Average math SAT score	OSSHE
HSGPA	Y5	Average high school GPA score	OSSHE
TSWE	Y6	Average TSWE score	OSSHE
FGPA	Y7	Average college/university freshman GPA score (1st quarter)	OSSHE
MGPA	Y8	Average college/university freshman math score (1st quarter)	OSSHE
CGPA	Y9	Average college/university freshman composition GPA score (1st quarter)	OSSHE
COLL	Y10	Percent students enrolled in college/university	School district, OSSHE
RET	Y11	Percent high school retention rate	School district

* Oregon State System of Higher Education (Office of Academic Affairs, School Relations Box 3175, Eugene, OR 97403-0175)

have been required to document "early leavers." Transfer students are not included in this statistic. For purposes of this study, an average retention percentage for the years 1982-1988 was based on the early leaver data plus school officials' personal knowledge and some retracing of enrollment files. The early leaver data compiled for this study is highly reliable because, since the surveyed schools were small, the students who left in their high school years were well remembered by teachers and counselors, who had invested considerable efforts to keep these students in school.

Data for education success variables Y1 to Y11 were collected for four consecutive school years (1984-85, 1985-86, 1986-87, and 1987-88). The sample sizes varied since data were not available for certain school districts and/or a particular year for each success criterion.

The expenditure data by school district were obtained from the Oregon Department of Education, School Finance and Data Information Services, Salem. Because such data are audited, they are highly reliable and accurate. Raw data were collected on expenditures, enrollment, and total certified staff for each school district for the school years 1981-82 through 1989-90. Expenditure categories were broadly categorized under two headings: Instruction Services Expenditures and Support Services Expenditures. The itemized expenditure categories shown in Table 4 were deemed of interest at the experimental design stage. All expenditures were calculated on a per-student basis.

Table 4. Expenditures-per-student variables selected for analysis

ODE Code[a]	Variable Name	Description
Instruction Services Expenditures		
—	E1	Student/Teacher Ratio
1100	E2	Teacher Salaries
1200	E3	Teacher Benefits
1210	E4	Gifted and Talented
1220 to 1250	E5	Mentally Retarded, Physically Handicapped, Emotionally Handicapped, Resource Rooms
1260	E6	Early Intervention
1270 to 1290	E7	Educationally Different and Other Special Programs
1300	E8	Adult/Continuing Education
Support Services Expenditures		
2110 to 2150	E9	Attendance and Social Work, Guidance, Health and Psychological Services, Speech Pathology and Audiology
2200	E10	Instructional Staff and Educational Media
2300 to 2400	E11	General and School Administration
2540	E12	Operation and Maintenance
2550	E13	Student Transportation
2500	E14	Capital
3000	E15	Community Service
—	E16	Total Expenditures

[a]Oregon Department of Education expenditure codes
[b]Also included in other codes

Since only four years of education success information was collected, school years 1984-85 to 1987-88, some method of developing corresponding expenditure data was necessary. Recognizing that education outcomes for any given year are likely the result of cumulative expenditures, expenditures per student were calculated as the average of the last year (year corresponding to education success information) plus the preceding three years. For example, expenditures per student for the school year 1984-85 includes expenditures for the following four years: 1981-82, 1982-83, 1983-84, and 1984-85. These four-year averages were the derived expenditure values used in the regression analyses. Given the original assumption that the study area is relatively stable, including limited mobility of the residents, the technique of averaging four years of data was considered to be realistic.

Another methodological issue concerns the lumping of elementary and secondary school expenditure data. It is doubtful that percent secondary/elementary students is consistent across all school districts surveyed; therefore, a possible bias could be introduced, particularly if there is an expenditure differential (per student) between elementary and secondary levels. A preliminary analysis of the 1989-90 test data (from Table 1) shows no detectable relationship between percent secondary enrollment and total expenditures per student. Therefore, the combined elementary and secondary expenditures presented in this study are considered to be representative of expenditures per student corresponding with the education success information, although varying expenditure allocation percentages within districts could confound this initial assumption.

Socioeconomic information is collected by school district by the U.S. Census Service every ten years. The most recent survey was conducted in 1980. This information is made available on micro-fiche in the Oregon State Library (copies of the micro-fiche plates for the respective school districts were purchased). The relevance of 1980 data is debatable, particularly for the later years, such as 1986-1989; however, the assumption of area stability was examined.

Table 5 presents the socioeconomic variables of interest in this study. This information is for the area of the respective school districts and is not necessarily representative of the parents of the high school students. Regression analyses of education success variables were based on average student performance results, 1985 to 1988.

Table 5. Socioeconomic variables by school district

Code	Description
C1	Stability Index
C2	Percent English Speaking Only
C3	Percent High School Graduates
C4	Percent College Graduates
C5	Percent Managerial and Professional Occupations
C6	Percent Farming and Forestry
C7	Median Family Income
C8	Percent Below Poverty Level
C9	Percent Rural Farm
C10	Percent White
C11	Percent American Indians
C12	Percent Married Couple Families

A special interest in this study was to survey parent perceptions on the issue of education success, as well as provide some initial data on parent participation in adult education activities. A single-page, 6-item opinion survey form was designed to collect parent data, specifically: parent's weighting of education success criteria, hours and description of adult education courses taken, sex of respondent, years of higher education completed, years of college completed, and years lived in the school district (see Appendix A). The survey procedures included:

1. Obtaining a list of names and addresses of parents/guardians of high school students enrolled in the 1989-90 school year, for each school district in the study.

2. Selecting a random sample representing 33.3 percent of the parents/guardians for each school district.

3. Mailing a survey form and cover letter, along with a stamped return envelope, to each parent/guardian selected for the study (January, 1991).

4. Mailing a reminder postcard one week later.

5. Mailing a final letter to nonrespondents three weeks later, with another copy of the survey and a stamped return envelope.

Since the parent survey responses represented 1989-90 data, only the latest available education success data (1987-88) were used in regression analyses to detect whether there was an association between parent participation in adult education and student performance.

RESULTS AND DISCUSSION

Descriptive Analysis

Socioeconomic Factors

An overall socioeconomic perspective of the school districts is shown in Table 6. The stability index, or percent of residents that have lived in the same house or same general area for the past 10 years, approximates 70 percent. This statistic is confirmed by the results of the parent survey showing that parents of high school students averaged 17.6 years residence in the area. Based on these observations, the other SES factors shown are believed to provide a good profile of area characteristics throughout the 1980s. A high level of homogeneity in human resources across districts is seen, with over 97 percent of the population being of white race and speaking English as the sole language. Education level attainment is quite uniform as well as percent married couple families. Factors showing the greatest variability across districts are median family income, percent below poverty level, and percent rural farm.

Expenditure Summaries

Average expenditures per student across all districts, 1982 to 1988, are shown in Table 7. All raw data were multiplied by the Portland inflation factor for 1990, allowing year-to-year comparisons in constant dollars. (The raw data are provided on the diskette located in the pocket at the back of the thesis. Retrieval instructions are in Appendix B.) A graphical depiction of expenditure trends during the study period, 1982 to 1988 (Figure 3), shows there was no

Table 6. 1980 U.S. Census data of socioeconomic factors by school district

District	Stability Index	English Language Only	Education Level: High School	Education Level: College	Occupation: Mgmnt./ Profes- sional	Occupation: Farming, Fishing, Forestry	Median Family Income*	Below Poverty Level	Rural Farm	White	Amer. Indian	Married Couple Family
Adrian 61	71.1	88.2	37.9	8.7	7.1	49.2	11,895	25.5	46.4	90.5	0.3	95.2
Arlington 3	66.0	98.1	42.0	16.9	16.0	22.0	20,277	7.5	24.0	96.7	0.1	96.3
Burnt River 30J	64.7	100.0	33.8	19.0	19.6	41.9	16,228	7.1	29.8	98.3	0.7	98.2
Condon 25J	71.1	100.0	35.7	15.8	23.0	30.3	15,625	11.3	22.9	95.6	0.6	85.2
Cove 15	80.1	99.0	43.4	15.1	17.4	32.5	15,694	15.9	29.3	99.0	0.4	100.0
Culver 4	62.1	90.3	44.7	10.1	14.1	17.6	17,179	10.1	13.5	91.7	1.9	87.1
Dayville 16J	55.3	100.0	48.0	12.4	16.2	31.7	14,063	16.0	13.4	97.1	0.6	85.2
Dufur 29	79.4	95.9	46.3	10.7	15.3	28.6	20,313	7.3	23.2	97.6	1.0	89.9
Echo 5	70.5	84.1	42.2	10.1	10.0	29.5	15,962	9.5	24.2	89.9	0.3	96.7
Fossil	68.9	99.3	46.7	9.2	15.2	28.1	12,778	14.7	10.8	99.4	0.0	88.5
Helix 1	86.3	100.0	39.0	13.8	15.2	41.0	20,556	8.8	27.1	98.1	0.0	94.4
Huntington 16J	74.1	100.0	49.0	7.4	18.5	12.8	12,969	20.5	6.9	98.5	0.9	88.8
Imbler 11	78.5	100.0	41.9	14.2	16.5	29.0	17,969	10.0	29.9	98.9	0.4	97.0
Jordan Valley 1, 3	54.5	81.2	45.0	13.6	12.8	29.4	13,333	28.4	22.6	95.7	0.6	98.5
Joseph 6	69.9	99.1	49.1	10.1	12.9	22.4	16,656	10.9	18.9	99.2	0.3	91.4
Long Creek 17	65.9	99.4	40.2	8.0	12.9	38.4	14,091	19.3	19.1	98.3	1.2	88.3
Mitchell 55	55.5	100.0	53.5	1.9	13.8	45.1	9,792	42.0	23.8	99.0	0.9	86.4
Mt. Vernon 6	68.4	99.0	42.8	8.1	14.0	23.1	17,169	12.6	8.8	98.9	0.6	88.4
Monument 8	71.8	99.0	38.3	9.3	16.5	52.0	13,409	22.9	24.2	99.0	0.3	93.7
North Powder 8J	69.1	98.5	41.1	10.6	23.4	17.4	13,897	13.0	23.0	97.9	0.8	81.0
Paisley 11	48.4	97.7	37.1	14.0	20.2	32.0	14,828	10.7	8.7	99.2	0.2	92.7
Pine Eagle 61	59.6	100.0	38.7	10.0	19.1	23.5	12,336	20.6	16.6	99.0	0.3	74.3
Prairie City 4	70.4	96.2	41.4	9.0	15.8	17.5	17,375	12.4	5.4	99.5	0.1	91.5
Sherman 1J, 17J	73.1	98.6	39.2	15.6	16.0	31.9	15,827	20.6	32.0	98.8	0.2	87.2
Spray 1	63.5	95.7	47.4	7.2	14.6	26.8	14,167	17.5	13.6	99.4	0.0	91.1
Ukiah 80	86.7	100.0	42.5	7.1	28.0	23.3	18,750	0.0	9.9	98.9	1.0	93.2
Wallowa 12	74.7	100.0	41.6	8.3	16.9	18.0	16,461	8.4	14.3	99.2	0.4	85.3
Average	68.9	97.0	42.5	11.0	16.3	29.4	15,541	14.9	20.1	97.5	0.5	90.6
Std. Deviation	9.1	5.0	4.5	3.7	4.1	9.8	2,637	8.2	9.2	2.6	0.4	5.7
Variance	82.9	24.7	20.1	13.4	16.9	96.5		67.8	84.1	6.9	0.2	32.6
Minimum	48.4	81.2	33.8	1.9	7.1	12.8	9,792	0.0	5.4	89.9	0.0	74.3
Maximum	86.7	100.0	53.5	19.0	28.0	52.0	20,556	42.0	46.4	99.5	1.9	100.0

Note: values shown as percent unless otherwise indicated

*Dollars

Table 7. Average enrollment and real expenditures per student across all districts (1982-1988)*

Variable	Year						
	1982	1983	1984	1985	1986	1987	1988
Average enrollment	201	195	201	177	177	181	182
Expenditures per student by code**							
1100	$1,951	$2,065	$2,076	$2,174	$2,269	$2,408	$2,274
1200	561	720	710	728	784	802	796
1210	0	0	0	0	2	2	2
1220 to 1250	10	1	0	0	1	3	10
1260	18	18	23	23	15	10	13
1270 to 1290	0	6	1	2	8	6	0
1300	0	0	0	0	0	0	0
1000	2,781	3,043	3,047	3,177	3,362	3,525	3,371
2110 + 2150	59	69	62	59	65	47	64
2200	143	137	136	154	158	156	150
2300 to 2400	538	621	621	655	672	676	693
2540	734	800	805	869	884	899	847
2550	407	411	448	441	441	455	456
2500	83	106	93	119	98	105	113
2000	2,210	2,420	2,437	2,581	2,595	2,639	2,594
3000	3	4	3	7	1	5	5
Grand total	4,994	5,467	5,487	5,765	5,958	6,169	5,970

* 1990 constant dollars

** Oregon Department of Education expenditure codes appreciable variation in average enrollment across districts. However, total expenditures per student, in constant dollars, increased by about $1,000 per student, indicating that overall commitment to public education ran ahead of inflation. Total instruction expenditures, mainly teacher salaries and benefits, increased by almost $600 per student. Support services increased slightly less, about $400 per student.

Summary statistics of expenditure, enrollment, and teacher data across all school districts and years are provided in Table 8. All expenditure data were calculated on a per student basis. Figure 4, a bar graph of expenditure categories of interest in this study, reveals that instruction services comprised about 56 percent of total school district outlay. Of this total, 68 percent went to teacher salaries and 23 percent to teacher benefit programs (see Figure 5). Average teacher salaries, in constant dollars, averaged $25,313, ranging widely from a low of $18,820 to a high of $34,604. Support services plus a small contribution to community services accounted for the remaining 44 percent as follows: operation and maintenance (33 percent), administration (25 percent), transportation (18 percent), noncertified instructional staff (6 percent), guidance and counseling (2 percent), other (16 percent) (see Figure 6).

The highest enrollment, grades 1 to 12, was 446 students; the lowest, 54 students. Average enrollment was 193 students, comprising elementary students (54 percent) and secondary students (42 percent). There were slight differences between districts in defining elementary and high school grade

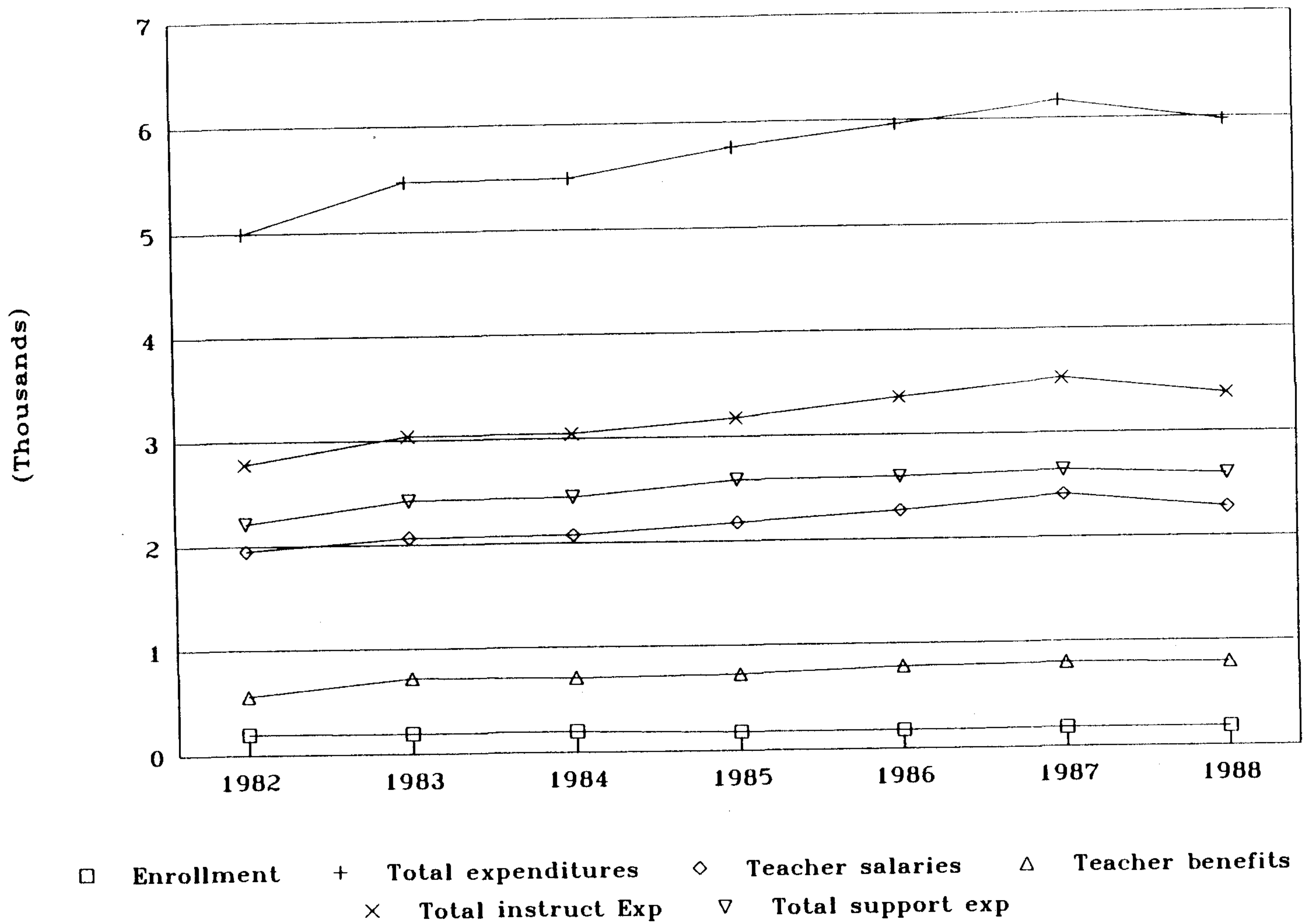

Figure 3. Average real expenditures per student all school districts, 1982 to 1988

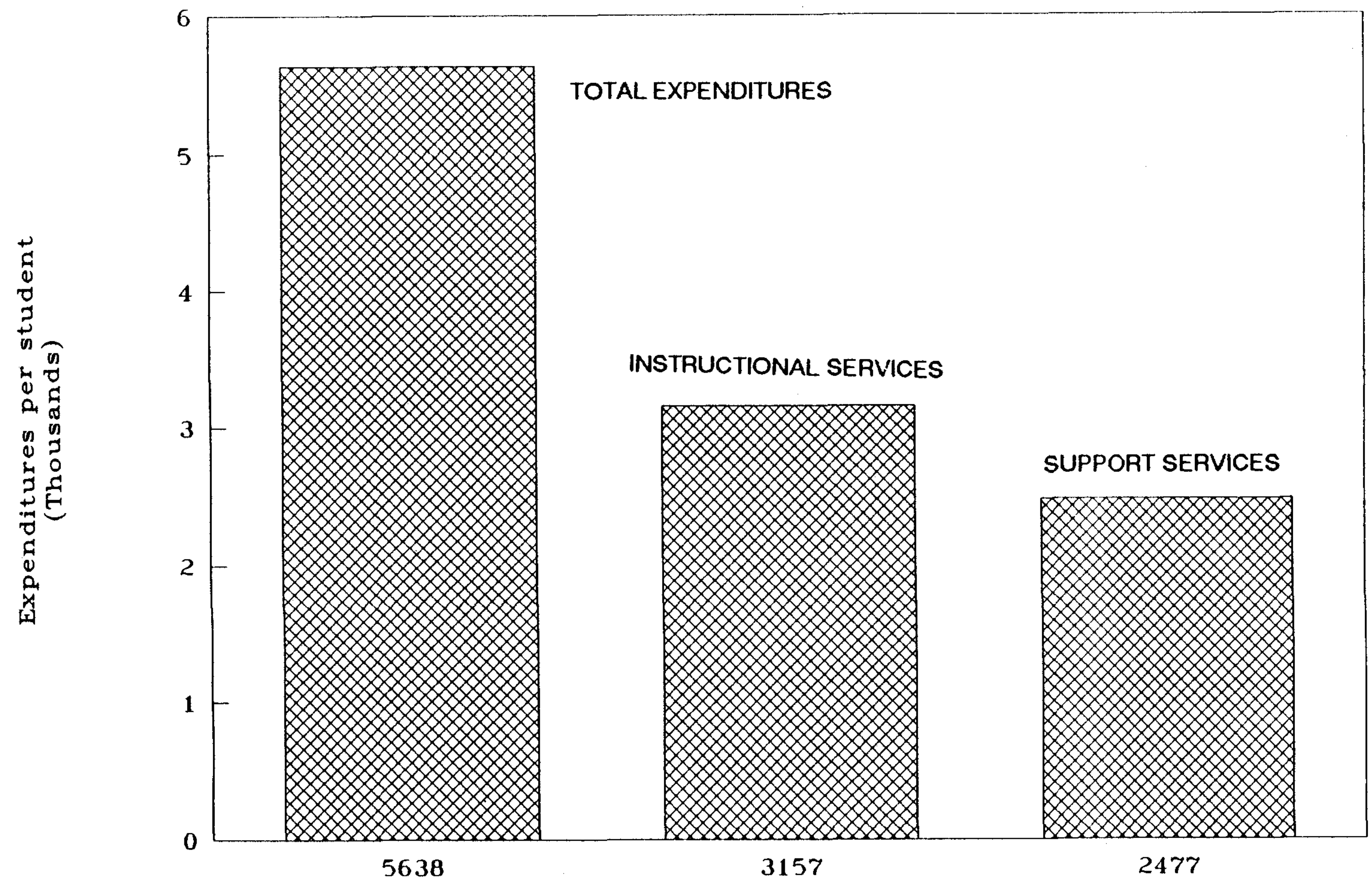

Figure 4. Average annual real expenditures per student, 1982 to 1988

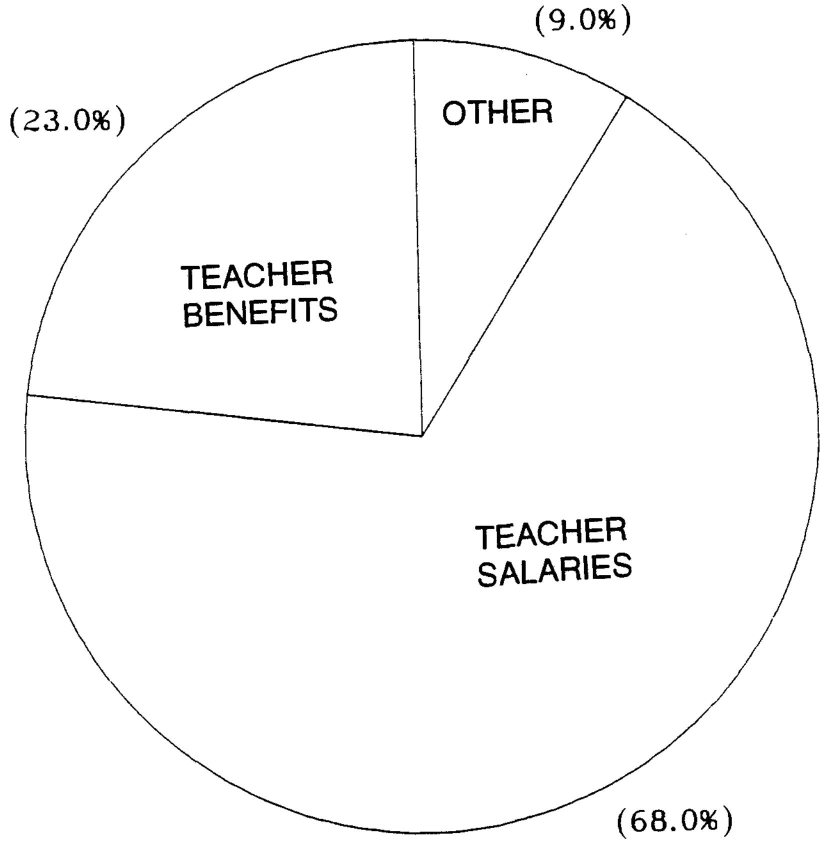

Figure 5. Percent allocation of instruction services, 1982-88

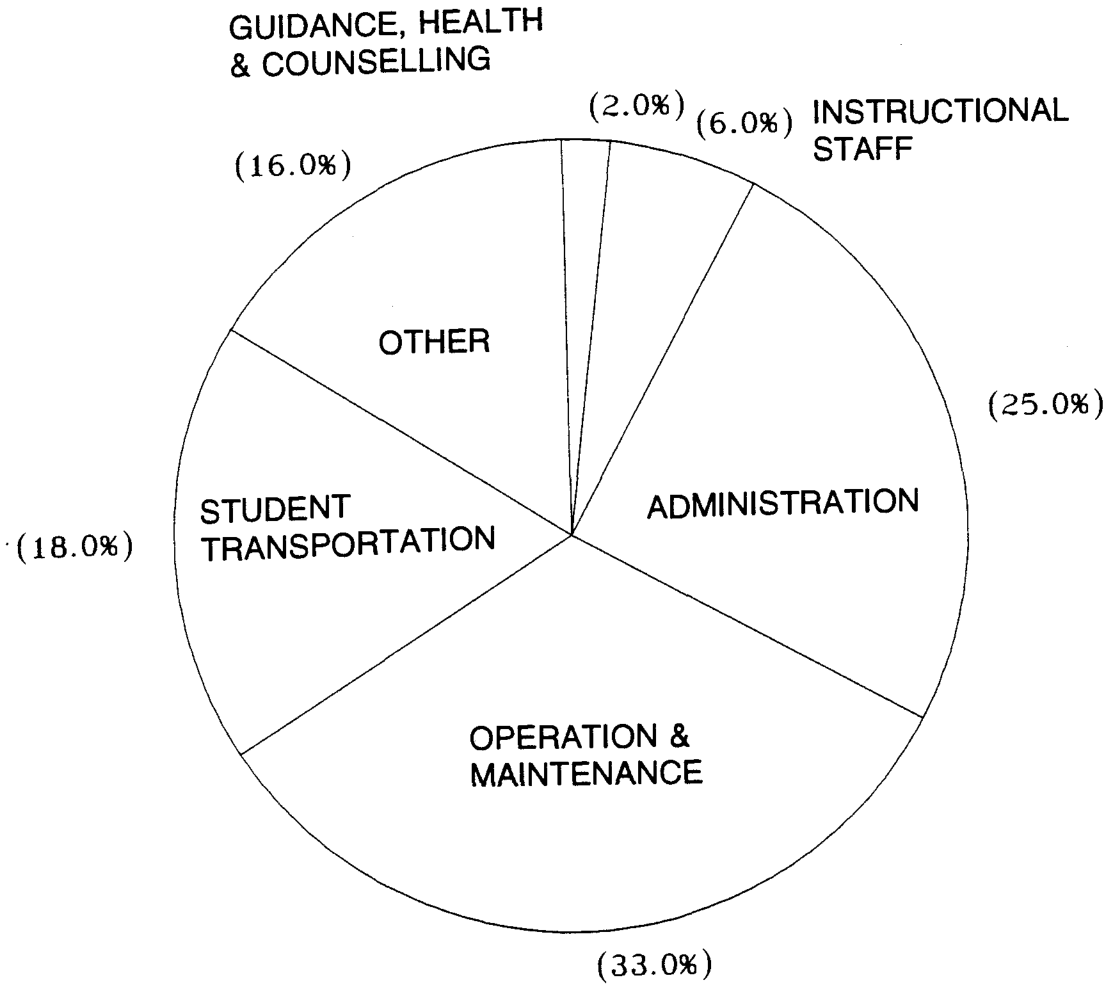

Figure 6. Percent allocation of support services, 1982-88

Table 8. Summary statistics on enrollment, teacher data, and expenditures across all districts (1982-1988)

Variable	Average	Standard Deviation	Maximum	Minimum
Enrollment				
Elementary	113	62	304	19
Secondary	80	43	192	17
Total enrollment	193	99	446	54
Percent secondary enrollment	41	10	69	23
Number of teachers	15	6	37	6
Student-teacher ratio	12.3	2.6	18.7	6.3
Salary per teacher (annual)	25,313	3,141	34,604	18,820
Expenditures*				
Instruction Services				
1100	2,152	529	4,544	1,244
1200	722	204	1,448	331
1210	0	6	50	0
1220-1250	3	20	184	0
1260	16	39	177	0
1270-1290	3	20	167	0
1300	0	0	0	0
1000	3,157	775	6,629	1,760
Support Services	60	83	395	0
2110 + 2150	148	91	426	9
2200	631	225	1,349	245
2300-2400	828	251	1,587	355
2540	436	284	1,606	22
2550	100	126	929	0
2500	2,477	772	4,605	1,056
2000	4	15	115	0
3000				
	5,638	1,475	11,042	2,933
Grand total				

* Oregon Department of Education expenditure codes

levels. The low enrollment statistics underscore the unique sample of districts analyzed in this study. Considerable variability is noted in nearly all the expenditure categories. These resource allocation differences are largely controlled at the local school district level, providing potentially fertile ground for studying relationships between expenditure levels and student performance.

Student Performance

Average test score performance (OSSHE values only), as well as percent college and percent early leavers, by school district, is shown in Table 9. Variables VSATE, MSATE, HSGPA, TSWE, MGPA, and CGPA (Y3 to Y9, respectively) are from OSSHE reports, recalling that OSSHE data represent the performance of only those students who attended four-year colleges and universities in Oregon in the fall term of the respective high school graduation years. The number of students enrolling in a four-year degree program immediately after graduation was relatively small, possibly the major criticism that can be made concerning the data set used in the subsequent analyses.

Correlation of Success Variables

To better understand the data, summary statistics across all districts and correlations of the education success variables are presented in Table 10 and Figure 7, respectively. As a general observation, the education success variables are not highly correlated. The district survey SAT scores (VSATS and MSATS) are positively associated with the OSSHE SAT scores, with r-values ranging from .15 to .57. However, VSATS and MSATS are negatively related to college performance indicators (Y7 to Y9) with low r-values (-.15 to -.25),

Table 9. Weighted average high school performance by school district, 1985 to 1988

School District	VSATE (Y3)	MSATE (Y4)	HSGPA (Y5)	TSWE (Y6)	FGPA (Y7)	MGPA (Y8)	CGPA (Y9)	Number of Students*	Percent College (Y10)	Early Leavers (Y11)
	438	489	3.29	41	2.39	2.21	2.47	30	72	2.06
Adrian	452	480	3.22	43	2.30	2.13	2.71	12	27	1.40
Arlington	464	524	3.45	49	2.69	2.76	3.33	9	34	0.00
Burnt River	389	442	3.32	43	2.65	2.31	2.91	13	32	1.40
Condon	441	494	3.14	42	2.49	2.32	2.25	21	28	1.67
Cove	385	472	3.14	36	2.45	2.34	2.71	11	23	5.92
Culver	415	510	3.50	48	2.17	2.00	3.17	3	10	1.80
Dayville	474	505	3.43	49	2.55	2.14	2.68	10	31	1.88
Dufur	375	400	3.00	41	1.99	0.67	2.17	6	21	0.95
Echo	543	583	3.34	49	2.91	2.00	2.00	3	11	0.00
Fossil	420	493	3.55	39	2.46	2.28	2.17	8	20	0.00
Helix	427	484	3.41	42	2.38	1.87	1.51	11	27	9.34
Huntington	428	469	3.35	43	2.47	2.61	3.17	34	41	3.02
Imbler	417	457	3.63	37	2.99	1.50	3.00	4	7	2.16
Jordan Valley	430	475	3.12	44	2.63	1.95	2.73	19	24	2.50
Joseph	454	472	3.04	42	2.27	2.02	1.76	7	36	0.00
Long Creek	500	500	3.78	48	1.80	1.00	1.50	2	17	4.00
Mitchell	387	411	3.36	35	1.90	1.82	3.00	10	45	0.50
Mt. Vernon	451	484	3.64	44	3.03	2.95	2.14	7	29	2.20
Monument	402	455	3.48	43	2.59	1.37	2.08	10	36	5.00
North Powder	429	464	3.25	38	1.93	1.17	2.02	11	30	1.40
Paisley	431	453	3.22	41	2.23	2.28	2.61	27	26	1.10
Pine Eagle	423	438	3.04	40	1.80	0.80	2.20	12	22	1.00
Prairie City	436	508	3.26	45	2.31	2.29	2.69	19	29	2.20
Sherman	345	412	3.33	35	2.11	2.23	3.00	5	24	1.60
Spray	454	460	3.18	42	2.54	2.60	3.02	20	25	5.50
Wallowa										

*OSSHE data; range 0 to 14 per year, depending on school district

Table 10. Summary statistics of education success variables across all school districts (1985 to 1988)

Variable	Average	Standard Deviation	Maximum	Minimum
Number of students*	3	3	14	0
VSATS	432	53	630	340
MSATS	461	47	620	388
VSATE	433	77	690	220
MSATE	480	75	720	300
HSGPA	3.4	30	4.0	2.1
TSWE	43	7	59	21
FGPA	2.4	.6	4.0	.7
MGPA	2.2	.8	4.0	.6
CGPA	2.8	.6	4.0	1.0
Percent college	21.5	15.6	82.4	0
Percent early leavers	2.5	2.4	9.3	0

* Number that attended Oregon four-year colleges and universities per school district each year

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11
VSATS (Y1)	1.00	.64	.57	.30	-.25	.24	-.22	-.23	-.25	.12	-.20
N		34	34	34	34	34	34	34	34	34	34
MSATS (Y2)		1.00	.27	.15	-.31	.18	-.15	-.15	-.15	.14	-.31
N			34	34	34	34	34	34	34	34	34
VSATE (Y3)			1.00	.78	.35	.74	.31	.46	0	0	0
N				95	92	93	94	78	73	95	95
MSATE (Y4)				1.00	.38	.65	.42	.20	.04	-.12	0
N					73	95	94	78	73	95	95
HSGPA (Y5)					1.00	.39	.53	.34	.28	-.14	0
N						94	93	78	73	93	93
TSWE (Y6)						1.00	.33	.19	.09	-.07	0
N							93	78	73	93	93
FGPA (Y7)							1.00	.61	.32	-.04	.10
N								78	73	78	78
MGPA (Y8)								1.00	.32	.11	0
N									73	78	78
CGPA (Y9)									1.00	-.16	.04
N										73	73
COLL (Y10)										1.00	0
N											95
DROP (Y11)											1.00

Figure 7. Correlation matrix of education success variables

whereas VSATE and MSATE are positively associated with correlation coefficients ranging from 0 to .46. This would suggest that the college cohort was not representative of all the students taking the SAT tests. However, average SAT scores by school district were only available in approximately one-third of the 27 districts sampled; whereas, OSSHE data were collected for all districts. The summary statistics show that average VSATS and VSATE are almost identical; however, MSATE is about 20 points higher than MSATS. The biggest difference is in the standard deviations, with test scores of the college cohort showing much more variability than district average SAT scores. This is confirmed by the maximum/minimum figures, showing that the college-bound students (VSATE and MSATE) had a much wider range in test scores. VSATE minimum was 220, maximum 690. Similarly, MSATE minimum was 300, maximum 720. The comparable results for VSATS and MSATS show a much narrower range in scores. The relatively wide range in variability for the OSSHE data is deemed a positive indicator that the students going on to college are drawn from a relatively wide band of innate learning abilities (assuming that SAT scores are positively associated with innate ability). However, this is not true for all districts, particularly where student numbers were small. Perhaps the strongest claim that can be made about the representativeness of the OSSHE data is that the data are possibly an indicator of how well school districts prepare their students for college. The average SAT data collected direct from the districts (VSATS and MSATS) are considered representative of district performance, since the same type of data is used in national studies of interstate performance comparisons. The obvious deficiency is that not all students take the SAT tests. Also, many of the small rural schools surveyed did not keep records of SAT scores. Very little correlation is observed between test score performance and percent students going on to college or percent early leavers. Some of the coefficients show negative signs, but the r-values are too low to be statistically significant. One other issue of interest is the relatively low association between SAT scores and college performance (Y7-Y9). The TSWE scores do not fare any better. The best indicator of college performance observed is HSGPA ($r = .53$ for HSGPA/FGPA).

Average percent college is 27.9 ± 12.6 percent over the period 1985 to 1988. This statistic ranges from a low of 6.8 to 71.8 percent between school districts. Early leavers or dropout percentages are very low, averaging 2.25 ± 2.16 percent per year over the four-year period studied, or approximately 9 percent for four years. This is approximately 45 percent below the national average according to Nachtigal's (1990) reported statistics. The range in average dropout rate by district is 0 to 9.3 percent per year. Low dropout rates are also found by Nachtigal (1990) for rural schools in South Dakota and Nebraska. Interviews conducted with superintendents and principals in most of the districts revealed some common elements, which may explain the very low dropout rates. Most important, the smallness of the schools makes it imperative to have maximum participation of all students in order to field sports teams, elect student council representatives, and be able to develop "community" and spirit. Individuals are very important, even if they demonstrate only mediocre athletic ability. Second, potential drop-out candidates can be more easily detected in small schools, compared to larger schools. Smallness makes it possible for more effective interaction between students and teachers as well as parents and teachers.

Student Performance Trends

Secular trends in student achievement, if present, can potentially influence the multiple regression analysis discussed in the next chapter. Table 11 shows changes over time in average performance. The test scores show year-to-year differences, but no perceptible trend is obvious. However, percent graduates enrolling in Oregon four-year colleges and universities has declined sharply since 1985. Within the four-year period, 1985 to 1988, the college cohort declined by approximately 36 percent. The observed drop in university enrollment may be accounted for by increased community college enrollment. However, no data are available by school district on students attending two-year community colleges. Out-of-state enrollment intentions indicate no trend that would explain this result. Further, out-of-state enrollment intentions reveal no districts that would be expected to have a disproportionate number of students enrolled in universities other than Oregon institutions.

Parent Opinion Survey

A total of 428 surveys were sent to parents, selected at random, representing one-third of the study population. The number of surveys completed and returned was 135, resulting in an average return of 32 percent.

Table 11. Average weighted student performance by year across all districts

Variable	1985	1986	1987	1988
VSATE (Y3)	436	390	419	430
MSATE (Y4)	491	433	455	463
HSGPA (Y5)	323	298	330	330
TSWE (Y6)	42	39	42	43
FGPA (Y7)	2.38	2.17	2.38	2.46
MGPA (Y8)	2.21	1.73	1.82	2.49
CGPA (Y9)	2.34	2.51	2.34	2.82
COLL (Y10)	34.50	33.9	30.6	22.0

Table 12. Summary statistics of parent survey data (1990)

Survey Item	Average	Standard Deviation	Maximum	Minimum
Parent Success Index Ratings				
Test scores	33.8	19.3	90.0	0
Low dropout rate	30.9	17.4	90.0	0
Percent college	25.5	15.2	100.0	0
Social maturity	1.9	7.5	50.0	0
Moral values	.7	5.1	40.0	0
Vocation training	4.9	14.1	100.0	0
No reason	2.4	8.6	50.0	0
Parent Data				
Hours adult education	14.8	52.4	495.0	0
Years secondary schooling	5.5	2.3	12.0	0
Years in area	17.6	13.1	61.0	0.1

For some districts there were no responses. Raw data on the parent survey results are presented in Appendix A. Table 12 provides summary statistics of the parent survey results across districts. Average results by school district are shown in Table 13. Parent weightings of education success placed test scores the highest (33.8%), closely followed by low dropout rate (30.9 percent). High percent of graduates going on to college was also considered an important index of a school's success (25.5 percent). Variability within these three success criteria was high. It is also noteworthy that frequently spouses had very different weightings from each other with respect to what constitutes education success. Other success criteria included: preparation of the high school graduate for a vocation (4.9 percent), achieving a high level of social maturity (1.9 percent), and having high moral values (.7 percent). A parent success index is calculated using only the three major success criteria. The weights used in subsequent analyses are 37.5, 34.2, and 28.3 percent, respectively, for test scores, retention rates (low dropout), and percent college.

The parents themselves averaged 14.8 hours of adult education in the previous year (1989-90), with a range of 0 to 495 hours. Average years of secondary plus college/university was 5.5 years or 1.5 years after high school graduation. Years lived in area averaged 17.6 ± 13.1 years, ranging from several months to 61 years.

Table 13. Averages of parent survey results by school district (1990)

School District	Test Scores	Low Dropout Rate	Percent College	Social Maturity	Moral Values	Voca-tional Training	No Reason	Hours/Year Adult Education	Years H.S. Plus College	Years Lived in Area
Adrian	31.9	19.9	28.3	0	0	20.0	0	6.7	4.8	15.0
Arlington	20.0	50.0	30.0	0	0	0	0	0	4.0	22.0
Condon	35.8	29.9	29.9	0	4.4	0	0	0	6.4	20.2
Cove	46.2	21.9	21.4	6.1	0	4.5	0	9.2	6.4	11.8
Culver	33.3	26.5	27.5	3.2	0	8.9	2.1	7.3	5.4	16.2
Dayville	50.0	25.0	25.0	0	0	0	0	0	4.0	10.0
Dufur	34.2	33.1	25.0	2.3	4.6	1.5	0.8	23.9	5.7	20.2
Echo	24.4	29.4	36.3	0	0	0	7.5	40.5	4.4	10.5
Fossil	32.2	22.3	37.2	0	0	8.3	0	1.8	5.2	23.7
Helix	43.6	21.4	32.1	2.9	0	0	0	33.0	4.9	16.6
Huntington	32.9	25.0	37.9	1.4	0	0	2.9	9.4	5.1	24.6
Imbler	38.7	18.0	34.4	2.7	1.3	3.0	2.2	26.7	5.7	17.5
Jordan Valley	34.0	17.5	28.1	0	0	20.4	0	3.9	5.4	24.3
Joseph	34.7	35.0	30.8	0	0	0	1.9	21.0	5.2	21.8
Long Creek	42.2	25.6	32.2	0	0	0	0	0	4.4	15.4
Mitchell	11.0	61.0	19.3	0	0	8.3	0.3	7.7	4.7	21.0
Monument	19.0	41.0	36.0	0	0	4.0	0	124.8	7.0	15.6
Paisley	34.3	24.6	32.9	5.7	0	1.1	1.4	9.4	5.0	13.1
Pine Eagle	25.6	25.7	34.8	3.1	0	4.6	6.2	9.7	5.5	20.5
Prairie City	25.9	22.5	36.7	0	0	11.9	2.5	6.0	5.1	16.5
Sherman	40.8	19.5	30.3	1.1	1.7	2.6	4.0	1.8	6.0	18.8
Wallowa	18.1	30.7	34.9	0	0	7.2	9.1	11.9	5.3	16.2

* There were no survey responses from five school districts:
Burnt River, Mt. Vernon, North Powder, Spray, and Ukiah

Economies of Size

Initial evidence of size economies was noted in the methodology section, using 1989-1990 data. This was tested with 108 observations for all school districts in the sample for the school years 1981-82 to 1987-88. Tables 14 to 19 present the regression results, with major expenditure variables as the dependent variables and student enrollment as the independent variable. Total expenditures (E16) are strongly negatively related to enrollment (t = -6.7, df = 106, p = .00). However, the high t-value is probably overstated due to possible autocorrelation with time-series data. The coefficient of -7.34 can be broadly interpreted to mean that, within the range of the sampled school districts and keeping all other factors constant, a doubling of school size, say from 100 to 200 students, could be expected to reduce total expenditures per student by about $734 per student. This, of course, assumes a linear relationship over the entire range of enrollments which may not be accurate. From a policy perspective, this reduction in anticipated costs must be weighed against possible negative size effects discussed in the section on multiple regression results. Also, the impact of long distance bussing on student achievement has to be considered. The latter subject is not addressed in this study.

The expected reductions in total expenditures per student with increasing enrollment can be identified by expenditure category. Table 20 shows the summarized coefficients of the major expense variables in decreasing order of contribution to the observed economies of size. The combined variables

Table 14. Regression of total expenditures per student (E16) against student enrollment (E8)

Variable	Estimated Coefficient	Standard Error	T-Ratio 106 DF	Partial Corr.
E8	-7.34	1.09	-6.72****	-0.54
Constant	7075.00	236.53	29.91****	0.94

r^2 = 0.2989, r^2 adjusted = 0.2923
Variance of estimate = 0.12445E+07
Standard error of estimate = 1115.6
Heteroscedasticity:
E**2 on X (B-P-G) test Chi square = 0.64 with 1 DF

**** significant @ $t_{.9995}$

Table 15. Regression of teacher salary expenditures per student (E2) against student enrollment (E8)

Variable	Estimated Coefficient	Standard Error	T-Ratio 106 DF	Partial Corr.
E8	-2.22	0.42	-5.28****	-0.45
Constant	2584.50	91.13	28.35****	0.94

r^2 = 0.2086, r^2 adjusted = 0.2011
Variance of estimate = 0.18476E+06
Standard error of estimate = 429.84
Heteroscedasticity:
E**2 on X (B-P-G) test Chi square = 0.16 with 1 DF

**** significant @ $t_{.9995}$

Table 16. Regression of teacher benefit expenditures per student (E3) against student enrollment (E8)

Variable	Estimated Coefficient	Standard Error	T-Ratio 106 DF	Partial Corr.
E8	-1.61	0.37	-4.32****	-0.38
Constant	1104.60	81.06	13.62****	0.79

r^2 = 0.1499, r^2 adjusted = 0.1419
Variance of estimate = 0.14619E+06
Standard error of estimate = 382.35
Heteroscedasticity:
E**2 on X (B-P-G) test Chi square = 5.39 with 1 DF

**** significant @ $t_{.9995}$

Table 17. Regression of administrative expenditures per student (E11) against student enrollment (E8)

Variable	Estimated Coefficient	Standard Error	T-Ratio 106 DF	Partial Corr.
E8	-1.23	0.16	-7.68****	-0.59
Constant	871.25	34.79	25.03****	0.92

r^2 = 0.3576, r^2 adjusted = 0.3516
Variance of estimate = 26935
Standard error of estimate = 164.12
Heteroscedasticity:
E**2 on X (B-P-G) test Chi square = 1.25 with 1 DF

**** significant @ $t_{.95}$

Table 18. Regression of operation/maintenance expenditures per student (E12) against student enrollment (E8)

Variable	Estimated Coefficient	Standard Error	T-Ratio 106 DF	Partial Corr.
E8	-1.08	0.19	-5.51****	-0.47
Constant	1044.70	42.63	24.51****	0.92

r^2 = 0.2226, r^2 adjusted = 0.2153
Variance of estimate = 40424
Standard error of estimate = 201.06
Heteroscedasticity:
E**2 on X (B-P-G) test Chi square = 2.20 with 1 DF

**** significant @ $t_{.9995}$

Table 19. Regression of student transportation expenditures per student (E13) against student enrollment (E8)

Variable	Estimated Coefficient	Standard Error	T-Ratio 106 DF	Partial Corr.
E8	-0.72	0.26	-2.71***	-0.25
Constant	574.20	57.49	9.98****	0.69

r^2 = 0.0650, r^2 adjusted = 0.0562
Variance of estimate = 73536
Standard error of estimate = 271.18
Heteroscedasticity:
E**2 on X (B-P-G) test Chi square = 2.87 with 1 DF

**** significant at $t_{.9995}$
*** significant at $t_{.9975}$

Table 20. Economies of size in rural school districts (Central Oregon and Eastern Oregon, 60 to 415 students)

Variable	Coefficient	T-Ratio	Percent
Total Expenditures (E-16)	-7.34	-6.72****	100.0
Teacher Salaries (E-2)	-2.22	-5.28****	30.2
Teacher Benefits (E-3)	-1.62	-4.32****	22.1
Administration (E-11)	-1.23	-7.68****	16.8
Operation/Maintenance (E-12)	-1.08	-5.51****	14.7
Transportation (E-13)	-0.72	-2.71***	9.8

**** significant @ $t_{.9995}$
*** significant @ $t_{.9975}$

teacher salaries (E2), teacher benefits (E3), administration (E11), operation/maintenance (E12), and student transportation (E13) account for more than 90 percent of the estimated size economies. Teacher salaries and benefits account for about 52 percent, largely reflecting the higher student-teacher ratios in the larger rural schools. Reductions in administration, operation/maintenance, and transportation expenditures are estimated at about $3 per student for the larger schools, accounting for about 41 percent of the estimated size effect. Again, these estimates assume a linear relationship over the entire enrollment range and that all other factors are held constant.

The t-ratio for transportation may not be significant if possible autocorrelation is taken into account. Further, transportation costs are based on present intradistrict routes. With consolidation, these costs could be expected to increase with much longer traveling distances.

Multiple Regression Analysis Results

Socioeconomic and Education Success

The analysis to detect the existence of significant associations between the explanatory variables and education success begins with a look at the socioeconomic (SES) factors, independent of the expense variables. This is necessitated for several reasons. First, the SES data are available for one year only (1980) and are not necessarily comparable with the expense data collected over a seven-year period (1982 to 1988). Further, some changes in SES composition may have occurred since 1980 changes, which are not readily testable.

To test for collinearity in the explanatory variables, the inverse correlation matrix of the SES variables was investigated. The results are shown in Figure 8. The diagonal values of this matrix indicate no evidence of the existence of multicollinearity. Further, based on preliminary regression runs, the original number of SES variables was reduced to those variables with the highest t-values, to increase the number of degrees of freedom in the final analyses. The variables with the highest t-values were: mobility index (C1), percent high school graduates (C3), percent adults in managerial/professional occupations C5), median family income (C7), percent rural farm (C9), and percent married couple (C12). Details of each regression run are provided in Appendix C. (In Appendix C, variables were renamed to comply with SHAZAM syntax rules as follows: C1 = former C1; C2 = former C3; C3 = former C5; C4 = former C7; C5 = former C9; and C6 = former C12.)

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
C1	3.33	-1.04	0.49	2.44	-0.78	1.20	-1.62	0.40	-2.39	0.96-01	0.42	-1.01
C2	-1.04	4.87	-0.93	-0.85	-0.27	-1.95	0.72	2.04	-0.14	-3.39	-0.40	2.20
C3	0.49	-0.93	2.80	1.45	0.55	1.73	0.69	-1.55	-0.93	0.13-01	-0.28	-1.13
C4	2.44	-0.85	1.45	4.16	-0.94	1.68	-1.66	0.88-01	-2.61	0.92-02	0.59	-1.35
C5	-0.78	-0.27	0.55	-0.94	2.83	0.21	1.46	1.18	0.57	-1.12	-0.94	0.22
C6	1.20	-1.95	1.73	1.68	0.21	3.90	-0.32	-1.43	-1.89	0.49	0.49-01	-1.97
C7	-1.62	0.72	-0.69	-1.66	1.46	-0.32	5.08	3.75	0.22	-1.34	-0.84	0.56-01
C8	0.40	2.04	-1.55	0.88-01	1.18	-1.43	3.75	6.88	-1.94	-2.86	-0.62	1.11
C9	-2.39	-0.14	-0.93	-2.61	0.57	-1.89	0.22	-1.94	4.71	1.62	-0.28-01	0.42
C10	0.96-01	-3.39	0.13-01	0.92-02	-1.12	0.49	-1.34	-2.86	-2.86	4.89	1.21	-1.11
C11	0.42	-0.40	-0.28	0.59	-0.94	0.49-01	-0.84	-0.62	-0.28-01	1.21	1.65	0.23-01
C12	-1.01	2.20	-1.13	-1.35	0.22	-1.97	0.56-01	1.11	0.42	-1.11	0.23-01	2.90

Figure 8. Inverse correlation matrix of socioeconomic variables (diagonal values are underlined; diagonal values >10 indicate multicollinearity)

Overall, the results from the regressions do not indicate significant associations between SES and education success. Exceptions are noted for FGPA in which percent residents living in the area for at least 10 years was negatively associated with the success criteria (estimated coefficient = -.36; t = -1.8 with 20 df) and median family income was positively associated (estimated coefficient = .0001; t = 1.7 with 20 df). The only other case is CGPA in which percent rural farm was positively associated with education success (estimated coefficient = .04; t = 1.78 with 20 df). These t-values were significant at $t_{.95}$.

The observed relatively benign or small influence of SES factors on education success agrees with results reported in the literature (Nachtigal, 1990; Wendling and Cohen, 1981). Not only do SES factors affect rural schools differently than urban schools, but factors such as area poverty differences have been shown to exhibit no effect in rural schools (Wendling and Cohen, 1981). Explanations for the curious relationship between rural SES and student performance include the existence of smaller schools in rural areas, more student-teacher interaction and more active community involvement in the public education process (Nachtigal, 1990). In their study of the American hinterland, George and Louise Spindler (1990) found that children in rural areas were highly valued, which is contrasted with metropolitan areas where children are valued but are often regarded as interference with personal achievement, pleasure, and self development. This conclusion, along with Nachtigal's findings, suggests that rural schools tend to overcome constraints imposed by negative SES factors, through closer interaction and involvement with students. Further, the data in Table 6 show that Central and Eastern Oregon school districts are homogeneous in respect to race and language contributing to the observed SES regression results. As noted earlier, almost 98 percent of the population across the school districts sampled were white, speaking English only. Also, stability of the areas is evidenced by relatively little out-migration.

Expenditures and Education Success

Since the main purpose of the study was to examine resource allocation relationships and education success, the SES regression results are helpful in that possible SES/expenditure interaction effects are minimized. The initial correlation matrix and inverse correlation matrix results of all the expenditure variables are presented in Figures 9 and 10, respectively.

The correlation information provides initial evidence of the possible existence of multicollinearity which can contribute to estimated coefficients that are fragile or non-robust. As would be expected, total expenditures (E16) are highly correlated with the major expense categories such as salaries (E2, r = .92), total support services (E15, r = .93), and operation/maintenance (E12, r = .86). Student-teacher ratio and total expenditures were inversely related (E1, r = -.88). Similarly, total support services (E15), which comprises expense categories E9 to E14, exhibited high r-values, particularly in the relationship with operation and maintenance expenses (E12, r = .86). The only other expense-related variables between which interdependence is suspected are student teacher ratio and salaries (E1 and E2, r = -.85).

E1	1.00				
E2	-0.84	1.00			
E3	-0.48	0.55	1.00		
E4	0.12	-0.54-01	-0.43-01	1.00	
E5	0.26-01	0.67-01	-0.27-01	-0.25-01	1.00
E6	-0.16-01	0.20-01	-0.62-01	0.76-01	0.48
	1.00				
E7	-0.14	-0.80-01	-0.10	-0.36-01	-0.54-01
	0.18	1.00			
E8	0.61	-0.45	-0.38	0.75-02	0.26
	0.16	-0.79-01	1.00		
E9	-0.18	0.20	-0.26-01	0.18	-0.12
	0.12	-0.11-01	0.83-01	1.00	
E10	-0.32	0.23	-0.14-01	0.88-01	-0.22
	-0.59-01	-0.47-01	-0.15	0.70	1.00
E11	-0.74	0.65	0.39	0.27-01	0.19-01
	0.11	0.57-01	-0.59	-0.16	0.72-01
	1.00				
E12	-0.67	0.72	0.37	-0.17	-0.15
	-0.13	-0.21	-0.47	0.16	0.27
	0.55	1.00			
E13	-0.41	0.34	0.27	-0.51-01	0.11-01
	0.18	-0.21	-0.25	0.29	0.27
	0.31	0.61	1.00		
E14	0.18-01	0.60-01	0.17-01	-0.21-01	-0.67-01
	-0.99-01	-0.15	-0.12	0.22	0.18
	0.39-01	0.90-01	0.13	1.00	
E15	-0.78	0.71	0.43	-0.88-01	-0.15
	-0.24-01	-0.12	-0.55	0.38	0.51
	0.65	0.85	0.75	0.24	1.00
E16	-0.87	0.91	0.52	-0.81-01	-0.59-01
	-0.10-01	-0.10	-0.54	0.34	0.42
	0.68	0.85	0.59	0.17	0.93
	1.00				
	E1	E2	E3	E4	E5
	E6	E7	E8	E9	E10
	E11	E12	E13	E14	E15
	E16				

Figure 9. Correlation matrix of expenditure variables (see Table 4 for variable names)

	E1 E6 E11	E2 E7 E12	E3 E8 E13	E4 E9 E14	E5 E10 E15
E1	10.91 -0.77 1.87 18.27	-3.09 1.57 -3.67	0.56 -1.46 0.43	-0.94 -0.45 -1.92	0.39 0.34 -4.59
E2	-3.09 1.89 -12.43 -206.83	107.99 2.32 6.13	0.48 -0.58 -5.88	1.10 -0.33 2.70	-0.59 -0.17 119.30
E3	-0.56 -0.47-01 0.92 -3.86	0.48 0.17 1.91	1.93 0.10 0.47	-0.12 0.82 0.41	0.17 0.74 -1.35
E4	-0.94 0.40 -01.98 -3.24	1.10 0.77-03 -0.27	-0.12 0.50 -1.38	1.55 -1.25 0.42	0.17-01 -0.47 5.28
E5	0.39 -0.75 0.22 -0.22	-0.59 0.28 0.56	0.17 -0.45 -0.24	0.17 0.51 -0.12	1.71 0.67-01 0.24
E6	-0.77 2.24 -2.47 -4.75	1.89 -0.50 -0.40	-0.47-01 0.23 -2.31	0.40 -1.43 0.16	-0.75 -0.43 7.01
E7	1.57 -0.50 0.24 -2.55	2.32 1.67 0.60	0.17 -0.71-01 0.79	0.77 -0.72 0.13	0.28 0.51 0.51
E8	-1.46 0.23 -0.83 -0.51	-0.58 -0.71-01 -0.72	0.10 2.55 -1.33	0.50 -1.23 0.14	-0.45 0.43 3.94
E9	-0.45 -1.43 5.16 -3.13	-0.33-01 -0.72-01 3.88	0.82 -1.23 2.90	-1.25 5.81 0.41	0.51 -0.30 -9.64
E10	0.34 -0.43 2.61 2.31	-0.17 0.51 2.67	0.74 -0.43 3.61	-0.47 -0.30 0.76	0.67-01 4.14 -11.26
E11	1.87 -2.47 11.07 24.47	-12.43 0.24 4.14	0.92 -0.83 7.25	-1.98 5.16 0.66	0.22 2.61 -33.24
E12	-3.67 -0.40 4.14 -19.91	6.13 0.60 11.62	1.91 -0.72 3.67	-0.27 3.38 2.29	0.56 2.67 -8.74
E13	0.43 -2.31 7.24 16.39	-5.88 0.79 -3.67	0.47 -1.33 10.26	-1.38 2.90 1.27	-0.24 3.61 -30.76
E14	-1.92 0.16-01 0.66 -6.79	2.70 0.13 2.29	0.41 0.14 1.27	0.42-01 0.41 1.86	-0.12 0.76 -1.59
E15	-4.59 7.01 -33.24 -245.06	119.30 0.51 -8.74	-1.35 3.94 -30.76	5.28 -9.64 -1.59	0.24 -11.26 206.08
E16	18.27 -4.75 24.47 428.11	-206.83 -2.55 19.91	-3.38 -0.51 16.39	-3.24 -3.13 -6.79	-0.22 2.31 -245.06

Figure 10. Inverse correlation matrix of expenditure variables (diagonal values are underlined; diagonal values >10 indicate multicollinearity)

By dropping subtotal as well as total expenditure variables and those variables with low t-values, nine expenditure and enrollment variables were selected for further analysis. These are shown by code and variable name in Table 21.

The inverse correlation of the nine selected variables is shown in Figure 11. As evidenced by the maximum diagonal value of 7.09 for variable E1 (student-teacher ratio), there was no suspected multicollinearity between the selected independent variables.

Another data issue raised earlier concerns the combining of elementary and secondary school expenditures. The introduction of a confounding bias to this factor was tested by regressing the selected expenditure variables against percent secondary school enrollment. No relationship was found between percent secondary school enrollment and variables E1, E2, E3, E7, E11, and E12. This implies that student-teacher ratios and teacher salaries, teacher benefits, special instruction, administration, and operation/maintenance expenditures per student were very similar between elementary and secondary schools within a given school district and year. However, for variable E9, guidance and counselling, secondary schools spent slightly more per student than the corresponding elementary schools. A differential was also found for E10, instructional staff expenditures. The possible bias due to greater levels of expenditures in secondary schools for these two expenditure categories is not considered to be a problem, since the underlying hypothesis connects secondary school expenditures and education success. Overall, these results

Table 21. Selected expenditure and enrollment variables used in regression analyses*

Variable Name	ODE Code**	Explanation
E1		Student-teacher ratio
E2	1100	Teacher salaries
E3	1200	Teacher benefits
E7	1270 to 1290	Educationally different & other special programs
E8***		Enrollment
E9	2110 to 2150	Attendance & social work, guidance, health & psychological services, speech pathology & audiology
E10	2200	Instructional staff & educational media
E11	2300 to 2400	General & school administration
E12	2540	Operations & maintenance

*Expenditures calculated as expenditures per student
**Oregon Department of Education
***Variable E8 renamed = enrollment

	E1	E2	E3	E4	E5	E6	E7	E8
E1	7.09	4.18	0.18	1.27	-1.21	0.09	1.03	1.56
E2	4.18	5.22	-0.74	0.98	-0.61	0.96	0.82	-0.69
E3	0.18	-0.74	1.57	0.15	0.29	0.04	0.26	0.15
E4	1.27	0.98	0.15	1.29	-0.06	-0.20	0.37	0.05
E5	-1.21	-0.61	0.29	-0.06	1.92	-0.35	0.26	0.46
E6	0.09	-0.96	0.04	-0.20	-0.35	2.67	-1.77	1.06
E7	1.03	0.82	0.26	0.37	0.26	-1.77	2.47	-0.22
E8	1.56	-0.69	0.15	0.06	0.46	1.06	-0.22	3.03

Figure 11. Inverse correlation matrix of selected expenditure variables

lend credibility to the assumption that the expenditure variables used in the regression analyses corresponded with the observed education success values. In other words, the four-year average expenditures per student are believed to be a good representation of monetary investments made in those students for which education success values were collected.

Table 22 summarizes the results of the multiple regression analyses in which statistically significant associations between expenditure variables and education success were found. Details of the regression runs are provided in Appendix C, including summary statistics, adjusted r^2, estimated coefficients and standard errors, t-ratios, and tests for heteroscedasticity. It is important to recall that the number of observations is not identical for all dependent variables, as data were not available for some school districts.

Examining the summarized results, significant associations are detected, in general, when the test score variables are modified by the parent success weightings or index (PSI) (see Figure 7). The modified test score variables are presented as variables 1B to 9B in Table 22. Significant relationships were also found in the regression of test scores, unmodified (variables 1A to 9A); however, in most cases, the value of the t-ratios was lower compared to that of the modified education success variables. These results indicate that parent ratings matter in resource allocation decisions. Since schools depend heavily on local taxes, parent ratings could have important policy implications.

Regression results with variables VSATS (Y1) and MSATS (Y2) indicate that special instruction and guidance, health, and counselling expenditures (E7

Table 22. Summary of significant estimated coefficients from multiple regression analyses of enrollment and selected per-student expenditure variables[a] and education success variables

Ed. Success Variables		Enrollment	Student-Teacher Ratio	Teacher Salaries	Teacher Benefits	Educationally Different & Other	Guidance, Health & Counselling	Instructional Staff & Media	Administration
VSATS	Y1a[b]								
	Y1b[c]					+.94 (1.93)*	+.04 (2.13)**	-.03 (-2.08)**	
MSATS	Y2a							-.26 (-1.78)*	
	Y2b					+.91 (1.79)*	+.04 (2.07)**	-.03 (-2.0)*	
VSATE	Y3a			-.07 (-1.73)*	+.11 (2.84)****		+.31 (1.89)*		
	Y3b	+.02 (1.99)**	-1.85 (-2.43)***	-.01 (-2.84)****					
MSATE	Y4a				+.06 (1.67)*		+.29 (1.84)*		
	Y4b	+.02 (1.83)*	-1.78 (-2.54)***	-.01 (2.74)***					
HSGPA	Y5a	-.001 (-1.90)*							
	Y5b		-1.49 (-2.17)**	-.01 (-2.10)**					
TSWE	Y6a			-.01 (1.68)*	+.01 (2.62)***	+.10 (2.17)**	+.03 (2.07)**		
	Y6b	+.02 (2.35)***	-1.65 (-1.99)**	-.01 (-2.87)***	-.01 (1.76)*		+.03 (1.82)*		
FGPA	Y7a	+.02 (1.69)*			-.001 (-2.60)***				
	Y7b				-.01 (-1.93)*				
CGPA	Y9a			-.001 (-1.80*	+.002 (1.69)*				+.001 (1.70)*
	Y9b			-.02 (-2.65)****					
COLL		+.02 (1.93)*	-2.84 (-3.00)****	-.02 (-.256)****					
DROP		+.06 (2.81)**	-4.43 (-2.50)***		-.005 (-2.08)*	-.07 (-1.96)*			

[a]E1 to E11 = expenditures per student b Dependent variable not modified c Dependent variable modified by parent success index

*significant @ $t_{.95}$ ** significant @ $t_{.975}$ *** significant @ $t_{.99}$ **** significant @ $t_{.995}$

and E9, respectively) are positively associated with education success. However, a negative relationship is indicated for expenditures made on instructional staff (E10). The OSSHE education success variables, Y3 to Y9, also show positive associations with expenditures in guidance and counselling (E9). Further, in one case, regressing TSWE (Y6) against special instruction (E7) shows a positive relationship. The consistent positive association between some of the education success variables and special instruction is a curious result, given the low expenditures in this category (average is $3 per student, ranging from $0 to $167). Special instruction includes funds for students who are educationally different, such as students with different cultural and language backgrounds.

The strongest relationships are found with variables student-teacher ratio (E1), enrollment (E8), and per-student expenditures on salaries (E2) and benefits (E3). In one case, administrative expenditures (E11) are positively associated with CGPA (Y9a). The lack of evidence of a stronger administrative effect is possibly due to a residual effect whereby the benefits of good administration are captured elsewhere. Student-teacher ratio is strongly negatively associated with education success when the OSSHE variables (Y3 to Y9) are the dependent variables. Similarly, percent college and percent retention (low dropout) rates are negatively associated with higher student-teacher ratios. These student-teacher ratio results agree with findings by King et al. (1989). Further, within the range of school sizes in this study (approximate range is 60 to 415 students), education success is associated with increasing enrollment, after accounting for student-teacher ratio. This observed relationship is most strongly noticeable in the case of percent retention rates. This would indicate that very small rural schools, compared to larger rural schools, are not as successful in reducing dropout rates. One exception of the size effect is noted in the case of variable HSGPA (Y5a), where size and performance are negatively related. Wendling and Cohen (1981) and Nachtigal (1990) also found increasing school size to be slightly positively associated with student achievement in rural schools. Generally, this positive size effect is attributed to wider course selection and more teaching equipment in the larger schools.

The findings on teacher benefits are less consistent, indicating both positive and negative associations with education success. However, salary expenditures per student (E2), when statistically significant, are consistently negatively associated with education success, after accounting for student-teacher ratio and enrollment effects. As noted in Table 8, teacher salaries vary widely, from an average low of $18,820 to an average high of $34,604 per year. Higher average salaries would be expected to be associated with increased teacher experience, although some districts have higher salary scales than others, likely reflecting community commitment to education, since all districts surveyed are involved in collective bargaining procedures with their certified teachers. Wendling and Cohen (1981) and Biniaminov and Glasman (1983) reported teacher's length of tenure to be a positive and direct predictor of high school achievement; however, King et al. (1989) found no correlation for this teacher experience factor. No data were collected on teacher experience in this study.

The negative coefficients for variable E2 (salary expenditures per student) may, in part, be due to the observed dramatic decline in percent college-bound students from 1985 to 1988, when during the same period real salary expenditures increased. This reduction in college enrollment effect is evident in variables VSATE (Y3b), MSATE (Y4b), HSGPA (Y5b), TSWE (Y6b), and CGPA (Y9b). In mosts cases, applying the parent success index (PSI), resulted in an increase in the statistical significance of the negative associations between salary expenditures and performance. Percent college (Y10) was also strongly negatively associated with salary expenditures, thereby influencing the results of the test score modified variables Y3b to Y9b. However, this does not provide a complete explanation, since some of the nonmodified success variables also show negative associations with salary expenditures per student. Those variables are VSATE (Y3a), TSWE (Y6a), and CGPA (Y9a). However, the value of the t-ratios is much lower for the nonmodified variables, demonstrating the impact of the declining percent college factor. However, the strongly negative association between both percent college and retention (low dropout) rates with salary expenditures is still not explained.

Another possible explanation for the negative salary-related coefficients is that some rural areas are more desirable than others, thereby affecting the ability of a district to attract the best teachers. Following this line of reasoning, the more undesirable areas would have to pay more to attract quality teachers, but may not be in a financial position to pay a high enough differential to make a positive difference. Given the remoteness of some of the school districts in the sample, distance to population/business centers such as The Dalles, Ontario, La Grande, and others may be a valid proxy for the hypothesized desirability factor. This hypothesis implies that teachers prefer to be closer to such population centers for a variety of reasons, including better access to social and cultural events, wider selection of jobs for spouses, and possibly more developmental opportunities for children. The remoteness theory is tested by regressing average salary expenditures per student versus distance to population/business centers, assessed property value per student (1989-1990 figures), and average student-teacher ratio. The relevant summary statistics and correlation and inverse correlation matrices for these variables are presented in Table 23 and Figure 12, respectively. Multicollinearity is not evident and the heteroscedasticity tests (see regression results) indicate that the residuals do not violate the usual distribution assumptions.

Table 23 shows that distances to population/business centers range widely, from 6 to 90 miles. Based on discussions with school officials in some of the remote districts, hard winters and hazardous driving conditions can isolate these areas for long periods, sometimes for up to three weeks.

The regression results are given in Table 24. The resulting adjusted r^2 value is .82, with all three hypothesized independent variables being statistically significant. Student teacher ratios are negatively related with salary expenditures, as would be anticipated. Assessed values are strongly

Table 23. Summary statistics for regressing variables R2, R3, and R4 versus R5*

Variable	Mean	SD	Variance	Minimum	Maximum
R2	35.2	25.3	642.1	6.0	90.0
R3	0.2+06	99223.0	0.9+10	74257.0	0.5+06
R4	12.4	2.1	4.7	7.5	16.2
R5	2110.6	455.1	0.2+06	1466.2	3480.6

* R2 = distance to population/business centers
R3 = assessed value per student (1989-90)
R4 = student-teacher ratio (1982-1988)
R5 = salary expenditures per student (1982-1988)

	R2	R3	R4	R5
R2	1.00			
R3	0.25	1.00		
R4	-0.45	-0.35	1.00	
R5	-.28	0.56	-0.86	1.00

CORRELATION MATRIX

	R2	R3	R4	R5
R2	5.70	-1.01	1.74	1.70
R3	-1.01	1.82	-1.29	-2.01
R4	1.74	-1.29	5.69	5.21
R5	1.70	-2.01	5.21	6.31

INVERSE CORRELATION MATRIX

Figure 12. Correlation and inverse correlation matrices for regressing variables R2, R3, and R4 versus R5

Table 24. Regression of salary expenditures per student (R5) versus distance to major centers (R2), assessed value per student (R3), and student-teacher ratio (R4)

Variable	Estimated Coefficient	Standard Error	T-Ratio 106 DF	Partial Corr.
R2	-3.12	1.73	-1.79*	-0.35
R3	0.14	0.42-03	3.37****	0.58
R4	-172.79	20.81	-8.30****	-0.87
Constant	4049.00	325.42	12.44****	0.93

r^2 = 0.8394, r^2 adjusted = 0.8175
Variance of estimate = 37793
Standard error of estimate = -171.73

Heteroscedasticity:
E**2 on X (B-P-G) test Chi square = 3.87 with 3 DF

* significant @ $t_{.95}$ **** significant @ $t_{.9995}$

associated with salary expenditures, implying that the richer areas pay higher salaries. The distance factor is statistically significant at the $t_{.95}$ level; the association with salary expenditures per student is negative. In the more remote areas, salary expenditures per student were actually lower. Therefore, if relative desirability is a significant factor affecting the negative salary expenditures associated coefficients, distance does not provide an explanation.

The regression of parent survey results for 1990 against 1987-88 education success criteria provided no statistical evidence of a link between parents enrolled in adult education, years of schooling, or length of years living in the area. Details of the regression runs are provided in Appendix A. The inability to find any significant associations is possibly linked to the fact that no long history of adult education participation data is available. It is noteworthy, however, that expenditure category 1300 (expenditures for adult education) was zero for all school districts from 1982 to 1988.

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to provide relevant and "new" research information which would help parents and school administrators in rural areas make better management decisions on how to allocate public education funds. Multiple regression analyses were used, relating socioeconomic effects (1980 data), per-student expenditures for both elementary and secondary schools (1982-1988), and education success (for years 1985-1988) across 27 small school districts in Central and Eastern Oregon.

By using the term "better," efficiency gains were not the primary focus, although size economies are very evident in the sampled rural schools (enrollment, grades 1 to 12, ranging in size from just under 60 to slightly over 400 students). As a rough estimation, schools with under 250 students can expect to achieve reductions in total per-student expenditures of $7 for each additional student. Given the average per-student expenditure of around $5,700 per year, an increase in school size of, say, 100 students through consolidation can be expected to reduce total costs to about $5,000 per student. Not considered in these estimates of size economies is the possible negative impact of extended bussing hours and the loss of any advantages arising from schools being more central to the students' homes. Consolidation could also affect long-standing community traditions. It was learned from visiting each school district represented in the study that schools often play a major role in the social life and make-up of these mostly remote rural areas. In many cases, the rural school is the central core of the extended community, providing an important bond that holds a rural society together. George and Louise Spindler (1990) provide a good sketch of this role played by rural schools in the transmission of values and cultural traditions in America's hinterland.

The concept of "better," in this study, is aimed mostly at student performance, also termed education success. Given the fact that about one-third of the nation's school children live in rural areas and, further, that research findings have shown urban and rural area differences in expenditures and socioeconomic associations with education success, further probing of such rural school issues was warranted. At the outset of this study, the passage of Measure 5 in Oregon in 1991, limiting the ability of local areas to levy taxes, was not envisioned. However, rural schools will be affected by this new law, likely leading to more school consolidations and less local input into education policy matters, particularly as they relate to local expenditures. Therefore, the findings of this study, it is hoped, will benefit school districts in the transition stage, moving from smaller to larger schools, so that some of the anticipated negative impacts are minimized. On a wider scale, the results could influence future policy measures in delivering instructional services to rural areas that will enhance the preparedness of high school graduates for entering institutions of higher learning.

The classic debate on whether area poverty or other negative socioeconomic-related factors are an overriding consideration in achieving education success is not a pervasive issue in rural areas. The results show that the impact of low incomes and other area deficiencies on student achievement was relatively benign, confirming the findings of other researchers (Wendling and Cohen, 1981). However, this general conclusion cannot be extended to include possible impacts of race and language issues, since over 97 percent of the residents in the study were white, speaking only English in the home. Smallness of schools and close community ties appear to create a desirable learning environment in which students see themselves as having individual value, irrespective of their backgrounds and even innate abilities. Whether this observation applies to the nation's rural Southeast is questionable, given the widespread poverty which is often linked with racial issues. Further research to examine possible unique socioeconomic effects on rural school performance in the Southeast is recommended. For Oregon, however, the effect of close community is most dramatically seen in the low dropout rates in the school districts studied, averaging just under 10 percent over a four-year period. These low rates are about 45 percent under the national average, similar to results of studies in other rural areas (Nachtigal, 1990). Yet, the very small rural schools were less successful than the medium or larger rural schools sampled. Therefore, school consolidation within the enrollment range studied is not expected to intensify possible negative impacts of area socioeconomic differences nor increase dropout rates. Dropout rates may actually decrease with having larger rural schools.

Resource allocation differences between rural school districts were significantly associated with education success. Notably, low student-teacher ratios were positively associated with high school performance, including the achievement of high test scores, percent graduates attending four-year colleges and universities, and low dropout rates, confirming similar results reported in the literature (King et al., 1989; Nachtigal, 1990). However, this is a controversial issue since opposite effects of high student-teacher ratios are reported in urban school studies (Wendling and Cohen, 1981). The observed student-teacher effect is independent of school size, since enrollment within the sample range is also positively associated with performance, even though size and higher student-teacher ratios are positively correlated. The size effect in rural areas, also reported by Wendling and Cohen (1981), is likely linked to wider course selection in the larger districts. The implication for school consolidation is that increasing size can be expected to increase education success, provided that low student-teacher ratios are maintained. Average student-teacher ratio in the schools studied was just over 12, ranging from 6 to 19. However, maintaining a relatively low ratio will reduce the expected size economies discussed earlier, since teacher salaries and benefits were found to contribute over $3 to the average $7 per student reduction in total per-student expenditures with enrollment increases. Also, student transportation costs could actually increase with longer distances. Therefore, a partial trade-off exists between achieving efficiency gains stemming from economies of size and student achievement. The issue is not size, but rather student-teacher ratios. The recommendation is that rural school consolidation policy should ensure low student-teacher ratios be one of the constraints in the restructuring process.

Per-student teacher salary expenditures, after accounting for student-teacher ratio and enrollment effects, was negatively associated with education success. This result draws attention to teacher salary levels and/or teacher experience as possible explanations. No data on teacher experience were collected in this study. However, Wendling and Cohen (1981) and Biniaminov and Glasman (1983) found teacher experience to be a positive predictor of student performance.

Salary levels are a function of area wealth and possibly some other factors, such as relative area desirability. By using distance of school districts to population centers as a proxy for relative desirability, an explanation for the negative salary associated performance effect was sought without avail. The more remote districts actually paid lower salaries. To better understand the salary effect, further research is recommended which should entail both quantitative and qualitative analyses (see review of qualitative research traditions by Jacob, 1987). If teacher experience in rural areas is indeed negatively related to education success, an explanation needs to be sought. Or some measure of area desirability, other than remoteness, should be investigated. In either case, qualitative studies are recommended such as ecological psychology research, which examines the relationship between human behavior and environment.

Other per-student expenditure variables positively associated with test score education success are those support services providing student guidance, health, and counselling and special instruction services to educationally different students. Expenditures on such individual student support services averaged $60 per year, with a wide range of $0 to $395 per student, or 2 percent of total expenditures. Allocation of funds for helping educationally different students, likely addressing language differences, ranged widely, from $0 to $167 per student per year. This result, if interpreted correctly, agrees with findings by Ovando (1989) that funding of special instruction for students whose primary language is other than English produces positive performance results. One support expenditure category, instructional staff and media (largely instructional aids), was negatively associated with average district SAT scores. Annual per-student expenditures for this student support service averaged $148 (range $9 to $426). These expenditure-related findings lead to the recommendation that more funds be allocated to guidance and counselling as well as special instruction services for educationally different students. The negative association of education success and instructional staff expenditures invites further study.

A second feature of the study was to solicit parent opinions on education success criteria. An opinion survey mailed to a random sample of one-third of the parents of high school students in the study area resulted in a 32 percent response. Based on the parent responses, a parent success index was developed. Relative rankings averaged 33.8 percent for high test scores, 25.5 percent for high percent students continuing to four-year colleges and universities, and 30.9 for low dropout rates, the three highest ranked education success variables. There was great variability in rankings between districts and even between spouses. The application of the PSI to the education success variables tended to magnify the enrollment, student-teacher ratio, and salary effects discussed earlier, as well as identify other significant expenditure-related education success associations. These results point out that parent opinions matter in making resource allocation decisions. School boards should seriously consider regularly scheduled surveys, possibly every three years, to determine parent attitudes and opinions on the combined education success objectives as well as other policy issues. This information could affect how resources are managed for greater allocative efficiency.

Other measures of high education success outcomes, based on parent responses, were: adequate preparation for vocations (4.9 percent), social maturity (1.9 percent), and high moral values (.7 percent).

The modeling of positive learning attitudes by parents, using adult education hours as a proxy variable, showed no significant association with student performance. Further research in this area is warranted, since in this study adult education was limited to those courses involving formal instructor-led offerings. Adult education is now seen as being much broader in scope, although quantitative measures are not well developed to study this more encompassing definition.

In summary, there is strong evidence provided in this study for improving education success in rural areas through informed resource allocation decisions, which should involve parent input. Efficiencies can be attained through school consolidations, but not without possible loss of community ties and values. Macro-studies such as this are useful, therefore, in quantifying the likely trade-offs in achieving higher student performance given the conflicting educational goals of equality, efficiency, and liberty.

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APPENDICES

Appendix A

Parent Survey Results

(1) Parent Survey Form

(2) Parent Survey Raw Data by School District

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Corvallis, OR 97331

PARENT EDUCATION SURVEY - EASTERN RURAL OREGON
November 1990

Each Parent or Guardian - Please complete a Separate Form
(Duplicate form is on the other side)

Question 1: If you were comparing school districts, what importance or weight would you assign to various education success criteria? Show you answer by allocating **a total of 100%** points AMONG the items below which indicate your standards of high school success.

A. High average standarized test scores ____________ percent

B. Low drop-out rates ____________ percent

C. High percent graduates attending college ____________ percent

D. Other (specify ________) ____________ percent

TOTAL 100 percent

Question 2: If you have attended any instructor led or formal self-study adult education course(s) in the past year, please list the course(s) and the total number of instruction hours for each course. Courses offered to adults may be wide ranging including general interest, job skills, parenting, crafts, languages, university credit, religious studies, basic reading or writing skills etc.

List of Type of Course(s) TOTAL INSTRUCTION HOURS

1.
2.
3.

Question 3: These are questions about yourself.

A. Check one: Female ____ Male ____

B. How many years of high school did you complete? _______ years

C. How many years of college did you complete? _______ years.

D. How many years have you lived in this school district? _____ years.

Parent Survey Data by School District

District (% return)	Parent Weightings by Success Criteria							Hours Adult Educ.	Years H.S. plus College	Years in Area
	Test Score	Low Dropout Rate	Percent College	Social Maturity	Moral Values	Voc. Training	No Reason			
Adrian	10	10	10			70			4	10
(17%)	10	10	10			70		32	6	10
	60	20	20					15	4.5	20
	33	34	33						4	15
	60	20	20						7	16
	40	40	20						3	16
	10	5	85						5	18
Condon	20	40	40						4	6
(31%)	33	33	34						4	6
	50	40	10						8	45
	40	20	40						8	45
	50	10	40						11	17
	20	20	20		40				8	46
	27	32	41						7	8
	32	34	34						4	8
	50	40	10						4	.5
Cove (60%)	50	25	25						3	2
	40	15	45						3	2
	20	20	20			40			10	30
	25	25	25			25		15	5	3
	80	10	10						7	1
	75	25							5	1
	40	20	20			20			4	2
	70	5	25						4	43
	40	5	5	50				81	10	4
	50		25	25				26	8	4
	28	40	32						4	2
	28	40	32						4	2
	17	56	17	10				34	5	14
	20	60	20					15	12	21
	75	15	10						4	18
	50	25	25						8	18
	65	10	25						10	35
	15	15	40	30					6	3
	90	5	5					3	10	20

District (% Return)	Parent Weightings by Success Criteria							Hours Adult Educ.	Years H.S. plus College	Years in Area
	Test Score	Low Dropout Rate	Percent College	Social Maturity	Moral Values	Voc. Training	No Reason			
Culver (44%)	80	10	10						4	5
	80	10	10						4	5
	60	10	30						6	21
	50	20	30						8	43
	5	25	70						5	19
	5	25	70						5	19
	50	25	25						4	11
	50	25	25						4	11
	15	30	25	30					8	4
	30	35	35	30					6	29
	33	34	33						5.5	39
	35	40	25						8	19
	25	50	25					60	3	5
	25	50	25					63	6	4
	30	30	40						4	4
	10	40	10			40		15	6	42
	20	30	20			30			9	16
	30	15	15				40		3	2.5
						100			3.8	10
Dayville	50	25	25						4	10
Dufur (62%)	40	40	20						9	17
	40	40	20						6	17
	30	30	40						6	46
	30	40	30					6	8	23
	25	50	25						5	3
	25	25	50						4	16
	30	40	30						7	16
	15	50	25				10		4	13.5
	25	50	25					280	5	13.5
	75	5	20						6.5	20
	40	20	20		20				5	27
	40	20			40					30
	30	20	20	30				25	9	21
Echo (20%)	30	40	10				20	156	5.5	10
	30	40	10				20	6	4	10
	25	25	50						4	11
	12.5	12.5	75						4	11

District (% Return)	Parent Weightings by Success Criteria							Hours Adult Educ.	Years H.S. plus College	Years in Area
	Test Score	Low Dropout Rate	Percent College	Social Maturity	Moral Values	Voc. Training	No Reason			
Fossil (40%)	33	34	33					7	4	9
	40	20	40						4	9
	20	20	10			50			4	27
	25	25	50						4	36
	25	25	50						5	38
	50	10	40					4	10	23
Helix (50%)	40	20	120	20				50	9	10
	50	25	25					130	6	10
	30	30	40						5	42
	30	30	40							22
	80	10	10						4	14
	50	20	30					15	4	14
	25	15	60					36	6	4
Huntington (50%)	25	50	25						1	14
	25	45	30						4	36
	40	30	30					50	8	36
	10	30	50	10					4	12
	30	10	40				20	16	10	12
	50	10	40						5	22
	50		50						4	40
Imbler (34%)	30	10	60					40	4	15
	25	25	50						6	16
	60	10	30						4	16
	60	28	12						4.3	7
	43	11	46						4	10
	40	10	25				25		7	11
	30	20	20		30				8	11
	49	1	50						4	8
	49	1	50					15		8
	45	10	45						3	.1
	45	10	45						3	18
	15	35	20			30			6	42
	20	40	20			20		10	9	21
	25	25	25				25	5	8	40
	33	33	34						10	38
	60		40						6	7.5
	80	10	10						9	7.5
	60	10	10			20			5	2

District (% Return)	Parent Weightings by Success Criteria							Hours Adult Educ.	Years H.S. plus College	Years in Area
	Test Score	Low Dropout Rate	Percent College	Social Maturity	Moral Values	Voc. Training	No Reason			
Imbler cont.	25	25	25	25				495	7	17
	30	30	30	10					6	21
	25	50	25						5	61
	20	20	40	20				45	9	13
	20		80					5	4.5	13
Jordan Valley (29%)	40	5	15			40			6	11
	30	15	25			30			4	11
	50	30	20					5	5	12
	60	10	30						5.5	40
		10	40			50		26	8	12
	2	5	50			43			4	41
	40	40	20						4	47
	50	25	25						7	20
Joseph (31%)	30	10	60						7	13
	75	10	15					33	7	12
	40	40	20						5	32
	20	60	20						4	33
	50	50						32	2	20
	45	45	10						4	1
	25	25	50						10	11
	30	40	30						4	11
	25	25	25				25		4	30
	10	50	40						5	25
	20	30	50						4	37
	10	40	50						6	40
	40	30	30					208	5.5	19
	30	30	40						1	19
	71	12	17					100	5.5	20
Long Creek (27%)	65	25	10						10	2
	46	23	31						3	6
	40	20	40						1	6
	30	30	40						4	52
	30	30	40						4	11
Mitchell (33%)	33	33	33				1	23	4	41
		50	25			25			4	11
		100							6	11

District (% Return)	Parent Weightings by Success Criteria							Hours Adult Educ.	Years H.S. plus College	Years in Area
	Test Score	Low Dropout Rate	Percent College	Social Maturity	Moral Values	Voc. Training	No Reason			
Monument (38%)	10	40	40			10		200	8	8
	10	40	40			10		400	8	8
	25	25	50					24	3	30
	25	50	25						8	16
	25	50	25						8	16
Paisley (50%)	20	5	75						4	40
	50	10	25			15			6	11
	30	20	50					24	4	18
	50	20	30					24	4	18
	10	50	40						4	27
	30	30	40						4	10
	30	20	50						4	10
	30	20	30				20		4	3.5
	60	10	30						7	10
	70	10	20						4	10
	35	40	25						4	2
	35	40	25					78	8	2
	20	30	10	40				6		11
	10	40	10	40						11
Pine Eagle (23%)	70	15	15						5	6.5
	20	20	20	40				8	4	6.5
	20	20	20				40	24	7	46
	20	20	20				40	70	8	27
	40	10	50						6	6
	20	10	70						10	6
	28	34	38						4	17
	20	40	40						4	45
	25	50	25					20	4	45
	25	50	25						2	19
	25	5	70						5	6
	20	40	30			10		2	4	18
		20	30			50		2	9	18

District (% Return)	Parent Weightings by Success Criteria							Hours Adult Educ.	Years H.S. plus College	Years in Area
	Test Score	Low Dropout Rate	Percent College	Social Maturity	Moral Values	Voc. Training	No Reason			
Prairie City (25%)	30	25	30			15			5	19
	25	25	25				25		6.5	19
	20	30	50						4	15
	25	25	50						4	16
	36	4	60						4	8
	36	4	60						4.5	8
	17	42	17			24			4	47
	30	40	20			10			4	25
	20	30	30			20			4	4
	20	5	25			50		60	11	4
Sherman (41%)	25	10	65					3	9	5
	45	5	50						9	5
	20	20	60						6	39
	50	25	25						5	17
	60	20	20						5	12
	60				40				4	4
	10	30	60						8	43
	40	40	20						5	42
	20	20	20				40	18	10	6
	25	30	25				20		7	5.5
	20	30	20			30		20	4	10
	20	30	20			30			4	10
	60	30	10						2	10
	50	10	8				32		4	10
	40	20	40						8	24
	50	30	20						6	24
	33	33	34						10	13
	40	10	50						5	13
	75	10	15						8	57
	50	10	20	20					5	22
	50		50						4	18
	40	25	35						6	16
	55	10	30	5					4	26

District (% Return)	Parent Weightings by Success Criteria							Hours Adult Educ.	Years H.S. plus College	Years in Area
	Test Score	Low Dropout Rate	Percent College	Social Maturity	Moral Values	Voc. Training	No Reason			
		25	25				50	30	6	6
Wallowa		25	25				50			6
(45%)		10	90						4	18
		10	90						4	35
		25	25			50		64	4	10.5
		40	10			50			4	20
	10	40	10			40			6	20
	10	40	10			40			4	2
	25	30	35						6	2
	35	30	30				20		6	10
		33	33				34	48	10	10
	10		80				10		6	10
		25	25			50			4	30
	50	25	25						4	33
	50	25	25					48	9	14
	30	30	40					24	9	14
	75	25							3	14
		75	25						6	37

Appendix B

Raw Data

(1) Raw Data on Education Success Values by School District

(2) Raw Data on Expenditures by School District

The diskette in the map pocket at the back of this thesis contains raw data on education success values and total expenditures by school district. Data can be retrieved on an IBM-compatible personal computer, using Quarto-Pro spreadsheet software (version 1.0, 2.0, or 3.0). Ask for the directory and select the school district of interest.

The file names are as follows:

ADRI.WQ1
ADRIC.WQ1
ARLI.WQ1
ARLIC.WQ1
BURN.WQ1
BURNC.WQ1
COND.WQ1
CONDC.WQ1
COVE.WQ1
COVEC.WQ1
CULV.WQ1
CULVC.WQ1
DAYV.WQ1
DAYVC.WQ1
DUFU.WQ1
DUFUC.WQ1
E1.WQ1
ECHO.WQ1
ECHOC.WQ1
FOSS.WQ1
FOSSC.WQ1
HELI.WQ1
HELIC.WQ1
HUNT.WQ1
HUNTC.WQ1
IMBL.WQ1
IMBLC.WQ1
IMBLERC.WQ1
JORD.WQ1
JORD3.WQ1
JOSE.WQ1
JOSEC.WQ1
KEY1.WQ1
LONG.WQ1
LONGC.WQ1
MITC.WQ1
MITCC.WQ1
MONU.WQ1
MONUC.WQ1
MOUN.WQ1
MOUNC.WQ1
NORT.WQ1
NORTC.WQ1
PAIS.WQ1
PAISC.WQ1
PINE.WQ1
PINEC.WQ1
PRAI.WQ1
PRAIC.WQ1
S1.WQ1
S2.WQ1
SHER.WQ1
SHERC.WQ1
SHERI7J.WQ1
SHERUH1J.WQ1
SPRA.WQ1
SPRAC.WQ1
UKIA.WQ1
UKIAC.WQ1
WALL.WQ1
WALLC.WQ1

Education success data files are designated by abbreviations of the school district names (e.g., ARLI.WQ1 = Arlington School District).

Expenditure data files are designated by a "C" at the end of the abbreviated names (e.g., ARLIC.WQ1).

E1, S1, S2, S3, and KEY1 are key files, not data files.

Appendix C

Regression Analysis Results

(1) Regression Analysis Results of Socioeconomic Variables

(2) Regression Analysis Results of Expenditure Variables

VSATS (Y1)

Regression of VSATS (1985-1988)

R-SQUARE = 0.2625 R-SQUARE ADJUSTED = 0.0551
VARIANCE OF THE ESTIMATE = 2742.1
STANDARD ERROR OF THE ESTIMATE = 52.365
LOG OF THE LIKELIHOOD FUNCTION = -220.131

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 32 DF	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
E1	-4.2630	12.743	-0.33455	-0.0590	-0.17242	-0.11716
E2	-0.80068E-01	0.86572E-01	-0.92487	-0.1614	-0.78344	-0.43175
E3	0.22752	0.20822	1.0927	0.1897	0.72382	0.42332
E7	3.5762	5.2137	0.68593	0.1204	0.14092	0.30174E-02
E8	-0.30117E-01	0.14619	-0.20602	-0.0364	-0.56407E-01	-0.14664E-01
E9	0.13987	0.21978	0.63642	0.1118	0.22016	0.25212E-01
E10	-0.25427	0.17142	-1.4834	-0.2536	-0.46564	-0.10118
E11	-0.70676E-01	0.92487E-01	-0.76418	-0.1339	-0.22984	-0.10790
E12	0.32203E-01	0.67673E-01	0.47586	0.0838	0.14146	0.66380E-01
CONSTANT	541.71	267.70	2.0236	0.3368	0.00000E+00	1.2547

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 9.00 WITH 9 D.F.

Regression of VSATS (1985-1988) Modified by Parent Success Index (PSI)

R-SQUARE = 0.3148 R-SQUARE ADJUSTED = 0.1221
VARIANCE OF THE ESTIMATE = 23.929
STANDARD ERROR OF THE ESTIMATE = 4.8917
LOG OF THE LIKELIHOOD FUNCTION = -120.561

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 32 DF	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
E1	-0.93672	1.1903	-0.78693	-0.1378	-0.39091	-0.19558
E2	-0.12031E-01	0.80871E-02	-1.4877	-0.2543	-1.2146	-0.49284
E3	0.24655E-01	0.19451E-01	1.2676	0.2187	0.80930	0.34849
E7	0.93855	0.48704	1.9271	0.3225	0.38160	0.60159E-02
E8	0.14279E-01	0.13656E-01	1.0456	0.1818	0.27594	0.52817E-01
E9	0.43713E-01	0.20531E-01	2.1291	0.3523	0.70993	0.59858E-01
E10	-0.33301E-01	0.16013E-01	-2.0797	-0.3451	-0.62922	-0.10066
E11	-0.92172E-03	0.86397E-02	-0.10669	-0.0189	-0.30928E-01	-0.10691E-01
E12	0.18807E-02	0.63217E-02	0.29750	0.0525	0.85242E-01	0.29451E-01
CONSTANT	74.058	25.007	2.9615	0.4638	0.00000E+00	1.3031

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 6.951 WITH 9 D.F.

Regression of Average VSATS and Socioeconomic Variables

R-SQUARE = 0.1348 R-SQUARE ADJUSTED = -0.1247
VARIANCE OF THE ESTIMATE = 9495.3
STANDARD ERROR OF THE ESTIMATE = 97.444
LOG OF THE LIKELIHOOD FUNCTION = -157.900

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
C1	-1.5445	2.7113	-0.56964	-0.1264	-0.15599	-0.25599
C2	4.6188	5.0739	0.91031	0.1995	0.22963	0.47281
C3	5.5797	5.7275	0.97419	0.2128	0.25415	0.21932
C4	-0.38192E-02	0.95784E-02	-0.39873	-0.0888	-0.11170	-0.14283
C5	2.5423	2.7740	0.91646	0.2008	0.25849	0.12288
C6	4.0634	3.8869	1.0454	0.2276	0.25746	0.88568
CONSTANT	-125.44	442.28	-0.28362	-0.0633	0.00000E+00	-0.30186

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI SQUARE = 3.368 WITH 6 D.F.

Regression of VSATS (1988) and Parent Variables

R-SQUARE = 0.0995 R-SQUARE ADJUSTED = -0.1461
VARIANCE OF THE ESTIMATE = 1775.3
STANDARD ERROR OF THE ESTIMATE = 42.135
LOG OF THE LIKELIHOOD FUNCTION = -75.0710

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 11 DF	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
P1	0.49402	1.1020	0.44831	0.1340	0.15606	0.15345E-01
P2	-5.7751	17.535	-0.32934	-0.0988	-0.99499E-01	-0.74346E-01
P3	-1.6991	3.1982	-0.53125	-0.1582	-0.18039	-0.74894E-01
CONSTANT	468.00	128.68	3.6370	0.7389	0.00000E+00	1.1339

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 4.648 WITH 3 D.F.

MSATS (Y2)

Regression of MSATS (1985-1988)

R-SQUARE = 0.3348 R-SQUARE ADJUSTED = 0.1477
VARIANCE OF THE ESTIMATE = 1962.6
STANDARD ERROR OF THE ESTIMATE = 44.301
LOG OF THE LIKELIHOOD FUNCTION = -213.107

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 32 DF	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
E1	5.3499	10.780	0.49626	0.0874	0.24290	0.13767
E2	-0.49950E-01	0.73241E-01	-0.68200	-0.1197	-0.54865	-0.25220
E3	0.19698	0.17616	1.1182	0.1939	0.70346	0.34316
E7	2.9207	4.4108	0.66218	0.1163	0.12920	0.23074E-02
E8	-0.18041E-01	0.12367	-0.14588	-0.0258	-0.37931E-01	-0.82250E-02
E9	0.15545	0.18594	0.83604	0.1462	0.27467	0.26236E-01
E10	-0.25803	0.14502	-1.7793	-0.3000	-0.53044	-0.96135E-01
E11	0.33331E-02	0.78245E-01	0.42599E-01	0.0075	0.12168E-01	0.47648E-02
E12	0.70054E-01	0.57252E-01	1.2236	0.2114	0.34545	0.13521
CONSTANT	326.09	226.48	1.4398	0.2467	0.00000E+00	0.70721

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 6.130 WITH 9 D.F.

Regression of MSATS (1985-1988) Modified by PSI

R-SQUARE = 0.2628 R-SQUARE ADJUSTED = 0.0554
VARIANCE OF THE ESTIMATE = 26.144
STANDARD ERROR OF THE ESTIMATE = 5.1131
LOG OF THE LIKELIHOOD FUNCTION = -122.421

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-0.51375	1.2442	-0.41291	-0.0728	-0.21277	-0.10488
E2	-0.10706E-01	0.84532E-02	-1.2665	-0.2185	-1.0726	-0.42881
E3	0.23311E-01	0.20332E-01	1.1466	0.1986	0.75936	0.32217
E7	0.90971	0.50908	1.7870	0.3012	0.36705	0.57014E-02
E8	0.14810E-01	0.14274E-01	1.0376	0.1804	0.28402	0.53565E-01
E9	0.44398E-01	0.21460E-01	2.0689	0.3435	0.71557	0.59445E-01
E10	-0.33466E-01	0.16738E-01	-1.9995	-0.3333	-0.62753	-0.98916E-01
E11	0.23347E-02	0.90307E-02	0.25853	0.0457	0.77743E-01	0.26477E-01
E12	0.35462E-02	0.66078E-02	0.53666	0.0944	0.15950	0.54297E-01
CONSTANT	64.571	26.139	2.4703	0.4002	0.00000E+00	1.1109

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 7.009 WITH 9 D.F.

Regression of MSATS and Socioeconomic Variables

R-SQUARE = 0.1402 R-SQUARE ADJUSTED = -0.1178
VARIANCE OF THE ESTIMATE = 10911.
STANDARD ERROR OF THE ESTIMATE = 104.46
LOG OF THE LIKELIHOOD FUNCTION = -159.777

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
C1	-2.1771	2.9065	-0.74905	-0.1652	-0.20448	-0.32799
C2	5.1618	5.4391	0.94901	0.2076	0.23865	0.48027
C3	5.9329	6.1397	0.96632	0.2112	0.25132	0.21197
C4	-0.18090E-02	0.10268E-01	-0.17618	-0.0394	-0.49203E-01	-0.61494E-01
C5	3.4190	2.9737	1.1498	0.2490	0.32329	0.15021
C6	3.7760	4.1667	0.90623	0.1986	0.22250	0.74810
CONSTANT	-91.921	474.11	-0.19388	-0.0433	0.00000E+00	-0.20106

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 3.138 WITH 6 D.F.

Regression of MSATS (1988) and Parent Variables

R-SQUARE = 0.1305 R-SQUARE ADJUSTED = -0.1066
VARIANCE OF THE ESTIMATE = 3336.9
STANDARD ERROR OF THE ESTIMATE = 57.766
LOG OF THE LIKELIHOOD FUNCTION = -79.8040

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
P1	-0.34851	1.5108	-0.23068	-0.0694	-0.78909E-01	-0.99759E-02
P2	-30.596	24.041	-1.2727	-0.3583	-0.37781	-0.36297
P3	-0.94446	4.3847	-0.21540	-0.0648	-0.71869E-01	-0.38366E-01
CONSTANT	632.08	176.41	3.5829	0.7339	0.00000E+00	1.4113

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 6.775 WITH 3 D.F.

VSATE (Y3)

Regression of VSATE (1985-1988)

R-SQUARE = 0.1368 R-SQUARE ADJUSTED = 0.0454
VARIANCE OF THE ESTIMATE = 5759.1
STANDARD ERROR OF THE ESTIMATE = 75.889
LOG OF THE LIKELIHOOD FUNCTION = -540.796

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-1.8510	9.3290	-0.19841	-0.0215	-0.54910E-01	-0.52887E-01
E2	-0.74608E-01	0.43190E-01	-1.7275	-0.1842	-0.45598	-0.36363
E3	0.10882	0.38301E-01	2.8413	0.2945	0.39952	0.18472
E7	0.62121	0.52792	1.1767	0.1266	0.14422	0.64118E-02
E8	0.12009E-01	0.11169	0.10751	0.0117	0.15036E-01	0.56479E-02
E9	0.30578	0.16186	1.8892	0.2007	0.30951	0.47888E-01
E10	-0.15237	0.14176	-1.0748	-0.1158	-0.17288	-0.53562E-01
E11	0.12783E-01	0.66025E-01	0.19360	0.0210	0.31900E-01	0.18005E-01
E12	0.28611E-01	0.55292E-01	0.51746	0.0560	0.86470E-01	0.54819E-01
CONSTANT	499.24	196.41	2.5418	0.2658	0.00000E+00	1.1526

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 13.474 WITH 9 D.F.

Regression of VSATE (1985-1988) Modified by PSI
R-SQUARE = 0.1273 R-SQUARE ADJUSTED = 0.0349
VARIANCE OF THE ESTIMATE = 36.448
STANDARD ERROR OF THE ESTIMATE = 6.0372
LOG OF THE LIKELIHOOD FUNCTION = -300.320

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-1.8020	0.74216	-2.4281	-0.2547	-0.67571	-0.38969
E2	-0.96777E-02	0.34359E-02	-2.8167	-0.2922	-0.74761	-0.35698
E3	0.44528E-02	0.30470E-02	1.4614	0.1566	0.20663	0.57205E-01
E7	-0.29824E-01	0.41997E-01	-0.71014	-0.0768	-0.87516E-01	-0.23297E-02
E8	0.17668E-01	0.88856E-02	1.9884	0.2108	0.27961	0.62889E-01
E9	0.18393E-01	0.12876E-01	1.4284	0.1531	0.23532	0.21801E-01
E10	-0.15529E-01	0.11278E-01	-1.3770	-0.1477	-0.22271	-0.41316E-01
E11	-0.22063E-02	0.52525E-02	-0.42004	-0.0455	-0.69593E-01	-0.23519E-01
E12	0.31576E-02	0.43986E-02	0.71786	0.0776	0.12062	0.45787E-01
CONSTANT	93.068	15.625	5.9562	0.5426	0.00000E+00	1.6261

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 12.321 WITH 9 D.F.

Regression of Average VSATE (1988) and Socioeconomic Variables

R-SQUARE = 0.1739 R-SQUARE ADJUSTED = -0.0740
VARIANCE OF THE ESTIMATE = 0.47960
STANDARD ERROR OF THE ESTIMATE = 0.69253
LOG OF THE LIKELIHOOD FUNCTION = -24.3401

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
C1	-0.20749E-01	0.19269E-01	-1.0768	-0.2341	-0.28814	-0.44628
C2	0.38089E-01	0.36060E-01	1.0563	0.2299	0.26037	0.50596
C3	0.47040E-01	0.40705E-01	1.1556	0.2502	0.29461	0.23993
C4	-0.13835E-04	0.68073E-04	-0.20324	-0.0454	-0.55637E-01	-0.67142E-01
C5	0.24017E-01	0.19715E-01	1.2183	0.2628	0.33577	0.15064
C6	0.26623E-01	0.27624E-01	0.96376	0.2107	0.23194	0.75302
CONSTANT	-0.43593	3.1432	-0.13869	-0.0310	0.00000E+00	-0.13613

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 3.258 WITH 6 D.F.

Regression of VSATE (1988) and Parent Variables

R-SQUARE = 0.1982 R-SQUARE ADJUSTED = 0.0567
VARIANCE OF THE ESTIMATE = 5788.2
STANDARD ERROR OF THE ESTIMATE = 76.080
LOG OF THE LIKELIHOOD FUNCTION = -118.546

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
P1	0.42214	0.73246	0.57634	0.1384	0.14635	0.16422E-01
P2	28.645	26.432	1.0838	0.2542	0.26447	0.35056
P3	6.3761	4.4336	1.4381	0.3293	0.32677	0.26678
CONSTANT	159.02	153.40	1.0366	0.2438	0.00000E+00	0.36624

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 10.383 WITH 3 D.F.

MSATE (Y4)

Regression of MSATE (1985-1988)

R-SQUARE = 0.1045 R-SQUARE ADJUSTED = 0.0097
VARIANCE OF THE ESTIMATE = 5656.9
STANDARD ERROR OF THE ESTIMATE = 75.212
LOG OF THE LIKELIHOOD FUNCTION = -539.946

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-1.2554	9.2459	-0.13578	-0.0147	-0.38274E-01	-0.32365E-01
E2	-0.56616E-01	0.42805E-01	-1.3227	-0.1420	-0.35561	-0.24898
E3	0.63455E-01	0.37959E-01	1.6717	0.1784	0.23942	0.97189E-01
E7	0.70121	0.52321	1.3402	0.1439	0.16730	0.65305E-02
E8	-0.39995E-01	0.11070	-0.36130	-0.0392	-0.51466E-01	-0.16973E-01
E9	0.29448	0.16042	1.8357	0.1953	0.30632	0.41612E-01
E10	-0.82932E-01	0.14050	-0.59027	-0.0639	-0.96707E-01	-0.26306E-01
E11	0.15519E-01	0.65436E-01	0.23716	0.0257	0.39802E-01	0.19723E-01
E12	0.33416E-01	0.54799E-01	0.60979	0.0660	0.10379	0.57770E-01
CONSTANT	528.91	194.66	2.7171	0.2827	0.00000E+00	1.1018

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 15.716 WITH 9 D.F.

Regression of MSATE (1985-1988) Modified by PSI

R-SQUARE = 0.1195 R-SQUARE ADJUSTED = 0.0263
VARIANCE OF THE ESTIMATE = 32.458
STANDARD ERROR OF THE ESTIMATE = 5.6972
LOG OF THE LIKELIHOOD FUNCTION = -294.814

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-1.7758	0.70037	-2.5356	-0.2652	-0.70873	-0.37066
E2	-0.88861E-02	0.32424E-02	-2.7406	-0.2849	-0.73063	-0.31637
E3	0.24567E-02	0.28754E-02	0.85439	0.0923	0.12134	0.30462E-01
E7	-0.26304E-01	0.39633E-01	-0.66370	-0.0718	-0.82155E-01	-0.19833E-02
E8	0.15380E-01	0.83852E-02	1.8341	0.1951	0.25906	0.52839E-01
E9	0.17896E-01	0.12151E-01	1.4727	0.1577	0.24369	0.20473E-01
E10	-0.12474E-01	0.10643E-01	-1.1721	-0.1261	-0.19041	-0.32033E-01
E11	-0.20859E-02	0.49567E-02	-0.42082	-0.0456	-0.70030E-01	-0.21462E-01
E12	0.33690E-02	0.41510E-02	0.81162	0.0877	0.13698	0.47153E-01
CONSTANT	94.373	14.746	6.4001	0.5703	0.00000E+00	1.5916

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 13.091 WITH 9 D.F.

Regression of Average MSATE and Socioeconomic Variables

R-SQUARE = 0.1722 R-SQUARE ADJUSTED = -0.0761
VARIANCE OF THE ESTIMATE = 90.328
STANDARD ERROR OF THE ESTIMATE = 9.5041
LOG OF THE LIKELIHOOD FUNCTION = -95.0564

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
C1	-0.18859	0.26445	-0.71315	-0.1575	-0.19102	-0.31579
C2	0.62253	0.49488	1.2579	0.2708	0.31039	0.64380
C3	0.70863	0.55862	1.2685	0.2729	0.32371	0.28140
C4	-0.14107E-03	0.93422E-03	-0.15100	-0.0337	-0.41378E-01	-0.53300E-01
C5	0.41910	0.27056	1.5490	0.3273	0.42736	0.20465
C6	0.24647	0.37911	0.65012	0.1439	0.15662	0.54273
CONSTANT	-12.483	43.137	-0.28938	-0.0646	0.00000E+00	-0.30349

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 2.734 WITH 6 D.F.

Regression of MSATE (1988) and Parent Variables

R-SQUARE = 0.1171 R-SQUARE ADJUSTED = -0.0387
VARIANCE OF THE ESTIMATE = 4557.8
STANDARD ERROR OF THE ESTIMATE = 67.511
LOG OF THE LIKELIHOOD FUNCTION = -116.037

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
P1	-0.42019E-01	0.64996	-0.64648E-01	-0.0157	-0.17227E-01	-0.15296E-02
P2	29.455	23.455	1.2558	0.2914	0.32158	0.33731
P3	2.4042	3.9342	0.61110	0.1466	0.14570	0.94130E-01
CONSTANT	264.52	136.13	1.9432	0.4263	0.00000E+00	0.57009

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 4.445 WITH 3 D.F.

HSGPA (Y5)

Regression of HSGPA (1985-1988)

R-SQUARE = 0.1223 R-SQUARE ADJUSTED = 0.0282
VARIANCE OF THE ESTIMATE = 0.11151
STANDARD ERROR OF THE ESTIMATE = 0.33393
LOG OF THE LIKELIHOOD FUNCTION = -24.9912

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	0.25348E-01	0.41065E-01	0.61725	0.0672	0.17331	0.93443E-01
E2	-0.35524E-04	0.19004E-03	-0.18692	-0.0204	-0.50051E-01	-0.22330E-01
E3	0.12059E-03	0.16874E-03	0.71465	0.0777	0.10204	0.26420E-01
E7	0.14152E-02	0.23235E-02	0.60909	0.0663	0.75717E-01	0.19039E-02
E8	-0.93616E-03	0.49316E-03	-1.8983	-0.2028	-0.26871	-0.57079E-01
E9	0.59113E-03	0.71269E-03	0.82944	0.0901	0.13761	0.12037E-01
E10	0.12485E-03	0.62383E-03	0.20014	0.0218	0.32656E-01	0.56640E-02
E11	0.36442E-03	0.29074E-03	1.2534	0.1355	0.20907	0.66038E-01
E12	-0.44014E-04	0.24345E-03	-0.18079	-0.0197	-0.30617E-01	-0.10858E-01
CONSTANT	2.9715	0.86430	3.4380	0.3512	0.00000E+00	0.88476

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 8.545 WITH 9 D.F.

Regression of HSGPA (1985-1988) Modified by PSI

R-SQUARE = 0.0714 R-SQUARE ADJUSTED = -0.0281
VARIANCE OF THE ESTIMATE = 31.478
STANDARD ERROR OF THE ESTIMATE = 5.6105
LOG OF THE LIKELIHOOD FUNCTION = -290.210

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-1.4927	0.68997	-2.1635	-0.2297	-0.62482	-0.27278
E2	-0.67091E-02	0.31930E-02	-2.1011	-0.2235	-0.57867	-0.20905
E3	0.69035E-03	0.28350E-02	0.24350	0.0266	0.35761E-01	0.74974E-02
E7	-0.44925E-01	0.39039E-01	-1.1508	-0.1246	-0.14714	-0.29959E-02
E8	0.87274E-02	0.82859E-02	1.0533	0.1142	0.15336	0.26377E-01
E9	0.10030E-01	0.11974E-01	0.83764	0.0910	0.14294	0.10124E-01
E10	-0.76975E-02	0.10481E-01	-0.73441	-0.0799	-0.12325	-0.17310E-01
E11	0.48565E-03	0.48848E-02	0.99420E-01	0.0108	0.17057E-01	0.43625E-02
E12	0.15483E-02	0.40904E-02	0.37854	0.0413	0.65936E-01	0.18935E-01
CONSTANT	97.215	14.522	6.6944	0.5898	0.00000E+00	1.4348

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 15.508 WITH 9 D.F.

Regression of Average HSGPA and Socioeconomic Variables

R-SQUARE = 0.1850 R-SQUARE ADJUSTED = -0.0596
VARIANCE OF THE ESTIMATE = 0.33958
STANDARD ERROR OF THE ESTIMATE = 0.58274
LOG OF THE LIKELIHOOD FUNCTION = -19.6794

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
C1	-0.35510E-02	0.16214E-01	-0.21900	-0.0489	-0.58208E-01	-0.10648
C2	0.15861E-01	0.30343E-01	0.52271	0.1161	0.12798	0.29373
C3	0.45367E-01	0.34252E-01	1.3245	0.2840	0.33539	0.32261
C4	-0.26650E-04	0.57281E-04	-0.46524	-0.1035	-0.12650	-0.18031
C5	0.19338E-01	0.16589E-01	1.1657	0.2522	0.31912	0.16910
C6	0.29737E-01	0.23245E-01	1.2793	0.2750	0.30581	1.1726
CONSTANT	-1.5419	2.6449	-0.58296	-0.1293	0.00000E+00	-0.67128

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 2.424 WITH 6 D.F.

Regression of HSGPA (1988) and Parent Variables

R-SQUARE = 0.1345 R-SQUARE ADJUSTED = -0.0278
VARIANCE OF THE ESTIMATE = 0.12824
STANDARD ERROR OF THE ESTIMATE = 0.35811
LOG OF THE LIKELIHOOD FUNCTION = -5.60887

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
P1	0.31539E-02	0.34564E-02	0.91250	0.2224	0.24624	0.16289E-01
P2	0.81404E-01	0.12822	0.63488	0.1568	0.16368	0.12704
P3	0.20547E-01	0.21263E-01	0.96634	0.2348	0.23658	0.10953
CONSTANT	2.5657	0.76796	3.3409	0.6410	0.00000E+00	0.74714

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 3.211 WITH 3 D.F.

TSWE (Y6)

Regression of TSWE (1985-1988)

R-SQUARE = 0.1660 R-SQUARE ADJUSTED = 0.0776
VARIANCE OF THE ESTIMATE = 46.019
STANDARD ERROR OF THE ESTIMATE = 6.7838
LOG OF THE LIKELIHOOD FUNCTION = -311.397

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	0.10712	0.83393	0.12845	0.0139	0.34944E-01	0.30959E-01
E2	-0.64841E-02	0.38608E-02	-1.6795	-0.1792	-0.43578	-0.31967
E3	0.89576E-02	0.34237E-02	2.6163	0.2730	0.36163	0.15380
E7	0.10239	0.47191E-01	2.1696	0.2291	0.26138	0.10690E-01
E8	0.86533E-02	0.99844E-02	0.86668	0.0936	0.11914	0.41167E-01
E9	0.29954E-01	0.14469E-01	2.0702	0.2191	0.33340	0.47451E-01
E10	-0.11200E-01	0.12672E-01	-0.88381	-0.0954	-0.13974	-0.39826E-01
E11	0.75209E-02	0.59020E-02	1.2743	0.1369	0.20639	0.10715
E12	0.58087E-02	0.49426E-02	1.1752	0.1264	0.19305	0.11258
CONSTANT	36.642	17.558	2.0869	0.2208	0.00000E+00	0.85569

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 12.599 WITH 9 D.F.

Regression of TSWE (1985-1988) Modified by PSI

R-SQUARE = 0.1451 R-SQUARE ADJUSTED = 0.0545
VARIANCE OF THE ESTIMATE = 45.075
STANDARD ERROR OF THE ESTIMATE = 6.7138
LOG OF THE LIKELIHOOD FUNCTION = -310.412

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-1.6452	0.82533	-1.9934	-0.2113	-0.54904	-0.29803
E2	-0.10960E-01	0.38209E-02	-2.8683	-0.2971	-0.75352	-0.33866
E3	0.59709E-02	0.33884E-02	1.7621	0.1877	0.24660	0.64257E-01
E7	0.14922E-01	0.46704E-01	0.31951	0.0346	0.38972E-01	0.97650E-03
E8	0.23231E-01	0.98814E-02	2.3510	0.2471	0.32722	0.69272E-01
E9	0.26026E-01	0.14320E-01	1.8175	0.1934	0.29635	0.25841E-01
E10	-0.16710E-01	0.12542E-01	-1.3323	-0.1430	-0.21328	-0.37242E-01
E11	0.25260E-02	0.58411E-02	0.43245	0.0469	0.70915E-01	0.22557E-01
E12	0.59880E-02	0.48916E-02	1.2241	0.1316	0.20358	0.72739E-01
CONSTANT	96.897	17.377	5.5763	0.5175	0.00000E+00	1.4183

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 12.036 WITH 9 D.F.

Regression of Average TSWE and Socioeconomic Variables

R-SQUARE = 0.2174 R-SQUARE ADJUSTED = -0.0174
VARIANCE OF THE ESTIMATE = 0.48158
STANDARD ERROR OF THE ESTIMATE = 0.69396
LOG OF THE LIKELIHOOD FUNCTION = -24.3956

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
C1	0.56372E-02	0.19309E-01	0.29195	0.0651	0.76038E-01	0.20314
C2	0.14248E-03	0.36134E-01	0.39430E-02	0.0009	0.94602E-03	0.31710E-02
C3	0.52356E-01	0.40789E-01	1.2836	0.2759	0.31850	0.44743
C4	0.89239E-05	0.68213E-04	0.13082	0.0292	0.34858E-01	0.72562E-01
C5	0.27462E-01	0.19755E-01	1.3901	0.2968	0.37292	0.28860
C6	0.11202E-01	0.27681E-01	0.40468	0.0901	0.94794E-01	0.53087
CONSTANT	-1.0431	3.1497	-0.33118	-0.0739	0.00000E+00	-0.54578

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 3.435 WITH 6 D.F.

No regression run on TSWE (1988) and parent variables.

FGPA (Y7)

Regression of FGPA (1985-1988)

R-SQUARE = 0.1434 R-SQUARE ADJUSTED = 0.0516
VARIANCE OF THE ESTIMATE = 0.31838
STANDARD ERROR OF THE ESTIMATE = 0.56425
LOG OF THE LIKELIHOOD FUNCTION = -74.3012

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	0.19761E-01	0.7003E-01	0.28228	0.0308	0.7872E-01	0.10195
E2	-0.19572E-05	0.32134E-03	-0.60908E-02	-0.0007	-0.16094E-02	-0.17274E-02
E3	-0.74152E-03	0.28477E-03	-2.6039	-0.2733	-0.36666	-0.22797
E7	0.22114E-02	0.39266E-02	0.56318	0.0613	0.69172E-01	0.41717E-02
E8	0.99254E-04	0.83385E-03	0.11903	0.0130	0.16750E-01	0.84412E-02
E9	0.12291E-02	0.12231E-02	1.0049	0.1090	0.16663	0.34350E-01
E10	0.86891E-04	0.10549E-02	0.82371E-01	0.0090	0.13276E-01	0.55103E-02
E11	0.82653E-03	0.49902E-03	1.6563	0.1778	0.27799	0.21047
E12	0.41898E-04	0.41390E-03	0.10123	0.0110	0.16973E-01	0.14562E-01
CONSTANT	2.0364	1.4673	1.3878	0.1497	0.00000E+00	0.85025

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 12.927 WITH 9 D.F.

Regression of FPGA (1985-1988) Modified by PSI

R-SQUARE = 0.1459 R-SQUARE ADJUSTED = 0.0544
VARIANCE OF THE ESTIMATE = 49.741
STANDARD ERROR OF THE ESTIMATE = 7.0527
LOG OF THE LIKELIHOOD FUNCTION = -311.715

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-1.4980	0.87499	-1.7120	-0.1836	-0.47676	-0.31215
E2	-0.63518E-02	0.40165E-02	-1.5814	-0.1700	-0.41727	-0.22644
E3	-0.68612E-02	0.35595E-02	-1.9276	-0.2058	-0.27103	-0.85201E-01
E7	-0.38248E-01	0.49080E-01	-0.77930	-0.0847	-0.95576E-01	-0.29144E-02
E8	0.17625E-01	0.10423E-01	1.6911	0.1814	0.23762	0.60546E-01
E9	0.16884E-01	0.15289E-01	1.1043	0.1196	0.18286	0.19059E-01
E10	-0.82757E-02	0.13185E-01	-0.62765	-0.0683	-0.10101	-0.21198E-01
E11	0.49677E-02	0.62375E-02	0.79642	0.0866	0.13348	0.51094E-01
E12	0.20196E-02	0.51735E-02	0.39038	0.0426	0.65363E-01	0.28352E-01
CONSTANT	88.284	18.341	4.8135	0.4650	0.00000E+00	1.4889

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 14.862 WITH 9 D.F.

Regression of Average FPGA and Socioceconomic Variables

R-SQUARE = 0.2541 R-SQUARE ADJUSTED = 0.0304
VARIANCE OF THE ESTIMATE = 0.47284
STANDARD ERROR OF THE ESTIMATE = 0.68764
LOG OF THE LIKELIHOOD FUNCTION = -24.1485

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
C1	-0.35707E-01	0.19133E-01	-1.8663	-0.3851	-0.47450	-1.0220
C2	0.18486E-01	0.35805E-01	0.51631	0.1147	0.12093	0.32678
C3	0.49031E-01	0.40417E-01	1.2131	0.2618	0.29385	0.33279
C4	0.11580E-03	0.67592E-04	1.7132	0.3577	0.44563	0.74785
C5	0.28257E-01	0.19575E-01	1.4435	0.3072	0.37803	0.23585
C6	0.19276E-01	0.27429E-01	0.70275	0.1552	0.16070	0.72552
CONSTANT	-0.83457	3.1210	-0.26740	-0.0597	0.00000E+00	-0.34681

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 2.507 WITH 6 D.F.

Regression of FGPA (1988) and Parent Variables

R-SQUARE = 0.2743 R-SQUARE ADJUSTED = 0.1462
VARIANCE OF THE ESTIMATE = 0.36660
STANDARD ERROR OF THE ESTIMATE = 0.60547
LOG OF THE LIKELIHOOD FUNCTION = -17.0423

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
P1	0.75992E-02	0.58292E-02	1.3037	0.3015	0.31495	0.50514E-01
P2	0.21837	0.21035	1.0381	0.2442	0.24101	0.45665
P3	0.55753E-01	0.35284E-01	1.5801	0.3579	0.34158	0.39861
CONSTANT	0.23944	1.2208	0.19612	0.0475	0.00000E+00	0.94231E-01

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 3.550 WITH 3 D.F.

MGPA (Y8)

Regression of MGPA (1985-1988)

R-SQUARE = 0.0673 R-SQUARE ADJUSTED = -0.0543
VARIANCE OF THE ESTIMATE = 0.66851
STANDARD ERROR OF THE ESTIMATE = 0.81763
LOG OF THE LIKELIHOOD FUNCTION = -90.8435

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-0.16488	0.11716	-1.4073	-0.1670	-0.47383	-0.91707
E2	-0.70292E-03	0.83623E-03	-0.84058	-0.1007	-0.43405	-0.67974
E3	-0.44823E-03	0.18956E-02	-0.23646	-0.0285	-0.10063	-0.14746
E7	-0.23762E-02	0.94628E-02	-0.25111	-0.0302	-0.32997E-01	-0.26349E-02
E8	0.99864E-03	0.13784E-02	0.72451	0.0869	0.12813	0.95028E-01
E9	0.55349E-03	0.20030E-02	0.27633	0.0332	0.56313E-01	0.17651E-01
E10	0.27446E-04	0.17311E-02	0.15854E-01	0.0019	0.31221E-02	0.18878E-02
E11	0.42794E-03	0.82004E-03	0.52185	0.0627	0.10214	0.11831
E12	0.14887E-03	0.63780E-03	0.23341	0.0281	0.45575E-01	0.56985E-01
CONSTANT	5.4537	2.4108	2.2622	0.2628	0.00000E+00	2.4570

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 7.901 WITH 9 D.F.

Regression of MGPA (1985-1988) Modified by PSI

R-SQUARE = 0.1536 R-SQUARE ADJUSTED = 0.0416
VARIANCE OF THE ESTIMATE = 82.668
STANDARD ERROR OF THE ESTIMATE = 9.0922
LOG OF THE LIKELIHOOD FUNCTION = -277.505

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-3.8070	1.3056	-2.9160	-0.3334	-0.94369	-0.80549
E2	-0.14986E-01	0.93935E-02	-1.5954	-0.1899	-0.79628	-0.55205
E3	-0.20073E-02	0.21862E-01	-0.91818E-01	-0.0111	-0.38517E-01	-0.25201E-01
E7	-0.83497E-01	0.10686	-0.78140	-0.0943	-0.10002	-0.35652E-02
E8	0.22984E-01	0.15666E-01	1.4671	0.1752	0.25241	0.83725E-01
E9	0.84706E-02	0.22287E-01	0.38008	0.0460	0.74020E-01	0.10398E-01
E10	-0.58900E-02	0.19408E-01	-0.30348	-0.0368	-0.57643E-01	-0.15483E-01
E11	-0.30804E-02	0.91238E-02	-0.33762	-0.0409	-0.63183E-01	-0.32276E-01
E12	0.58874E-03	0.71024E-02	0.82892E-01	0.0101	0.15521E-01	0.85857E-02
CONSTANT	136.11	27.067	5.0288	0.5207	0.00000E+00	2.3314

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 10.958 WITH 9 D.F.

Regression of Average MGPA and Socioeconomic Variables

R-SQUARE = 0.3405 R-SQUARE ADJUSTED = 0.1427
VARIANCE OF THE ESTIMATE = 156.59
STANDARD ERROR OF THE ESTIMATE = 12.514
LOG OF THE LIKELIHOOD FUNCTION = -102.484

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
C1	0.25840	0.34818	0.74213	0.1637	0.17742	0.66141
C2	-1.0680	0.65158	-1.6391	-0.3441	-0.36099	-1.6884
C3	-0.47082	0.73551	-0.64012	-0.1417	-0.14580	-0.28579
C4	-0.71422E-03	0.12300E-02	-0.58065	-0.1288	-0.14202	-0.41250
C5	0.41950	0.35623	1.1776	0.2546	0.28998	0.31314
C6	-0.69852E-01	0.49915	-0.13994	-0.0313	-0.30090E-01	-0.23513
CONSTANT	71.232	56.796	1.2542	0.2700	0.00000E+00	2.6473

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 5.898 WITH 6 D.F.

No regression run on MGPA (1988) and parent variables.

CGPA (Y9)

Regression of CGPA (1985-1988)

R-SQUARE = 0.1027 R-SQUARE ADJUSTED = -0.0111
VARIANCE OF THE ESTIMATE = 0.39170
STANDARD ERROR OF THE ESTIMATE = 0.62586
LOG OF THE LIKELIHOOD FUNCTION = -71.6382

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-0.67469E-01	0.84346E-01	-0.79991	-0.0945	-0.25460	-0.30428
E2	-0.11481E-02	0.63667E-03	-1.8033	-0.2093	-0.86793	-0.86980
E3	0.23687E-02	0.14056E-02	1.6852	0.1961	0.67153	0.60935
E7	-0.91206E-03	0.62622E-02	-0.14565	-0.0173	-0.18655E-01	-0.86566E-03
E8	0.69330E-03	0.97793E-03	0.70895	0.0838	0.11074	0.53609E-01
E9	0.11664E-02	0.15313E-02	0.76169	0.0900	0.14540	0.27976E-01
E10	-0.44931E-04	0.13172E-02	-0.34111E-01	-0.0040	-0.63087E-02	-0.23944E-02
E11	0.10340E-02	0.60794E-03	1.7008	0.1979	0.32406	0.22170
E12	-0.29278E-03	0.49193E-03	-0.59516	-0.0705	-0.11323	-0.87859E-01
CONSTANT	3.7596	1.8063	2.0814	0.2398	0.00000E+00	1.3526

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 12.547 WITH 9 D.F.

Regression of CPGA (1985-1988) Modified by PSI

R-SQUARE = 0.1648 R-SQUARE ADJUSTED = 0.0589
VARIANCE OF THE ESTIMATE = 49.324
STANDARD ERROR OF THE ESTIMATE = 7.0231
LOG OF THE LIKELIHOOD FUNCTION = -267.483

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-2.8411	0.94649	-3.0017	-0.3356	-0.92172	-0.56400
E2	-0.18914E-01	0.71444E-02	-2.6473	-0.2997	-1.2293	-0.63074
E3	0.21480E-01	0.15773E-01	1.3618	0.1595	0.52355	0.24323
E7	-0.50712E-01	0.70271E-01	-0.72166	-0.0853	-0.89177E-01	-0.21187E-02
E8	0.21175E-01	0.10974E-01	1.9296	0.2232	0.29080	0.72071E-01
E9	0.20128E-01	0.17183E-01	1.1714	0.1377	0.21572	0.21251E-01
E10	-0.12696E-01	0.14781E-01	-0.85897	-0.1014	-0.15327	-0.29783E-01
E11	0.48191E-02	0.68220E-02	0.70640	0.0835	0.12985	0.45483E-01
E12	-0.15835E-02	0.55202E-02	-0.28685	-0.0340	-0.52653E-01	-0.20916E-01
CONSTANT	117.80	20.269	5.8119	0.5678	0.00000E+00	1.8655

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 17.888 WITH 9 D.F.

Regression of Average CGPA and Socioeconomic Variables

R-SQUARE = 0.3105 R-SQUARE ADJUSTED = 0.1037
VARIANCE OF THE ESTIMATE = 0.71497
STANDARD ERROR OF THE ESTIMATE = 0.84556
LOG OF THE LIKELIHOOD FUNCTION = -29.7306

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
C1	-0.14796E-01	0.23527E-01	-0.62887	-0.1392	-0.15373	-2.0876
C2	0.22911E-01	0.44028E-01	0.52036	0.1156	0.11718	1.9964
C3	0.10619E-01	0.49700E-01	0.21366	0.0477	0.49761E-01	0.35531
C4	0.25502E-04	0.83116E-04	0.30682	0.0684	0.76730E-01	0.81187
C5	0.42929E-01	0.24071E-01	1.7834	0.3704	0.44904	1.7663
C6	0.46058E-01	0.33729E-01	1.3656	0.2920	0.30022	8.5459
CONSTANT	-5.0710	3.8378	-1.3213	-0.2833	0.00000E+00	-10.388

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 5.818 WITH 6 D.F.

No regression run on CGPA (1988) and parent variables.

COLL (Y10)

Regression of COLL (1985-1988)

R-SQUARE = 0.1850 R-SQUARE ADJUSTED = 0.1061
VARIANCE OF THE ESTIMATE = 219.21
STANDARD ERROR OF THE ESTIMATE = 14.806
LOG OF THE LIKELIHOOD FUNCTION = -418.477

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	-4.4269	1.7717	-2.4986	-0.2508	-0.64862	-2.5167
E2	-0.19621E-01	0.76621E-02	-2.5608	-0.2567	-0.59792	-1.9543
E3	-0.46307E-02	0.44596E-02	-1.0384	-0.1071	-0.12473	-0.17068
E7	-0.99995E-01	0.10171	-0.98314	-0.1014	-0.11080	-0.19166E-01
E8	0.59248E-01	0.21098E-01	2.8082	0.2796	0.37177	0.53919
E9	0.23843E-01	0.30919E-01	0.77115	0.0797	0.11737	0.70190E-01
E10	-0.21906E-01	0.26460E-01	-0.82790	-0.0855	-0.12194	-0.15222
E11	-0.63946E-02	0.12310E-01	-0.51947	-0.0538	-0.82871E-01	-0.18626
E12	0.10872E-01	0.10240E-01	1.0617	0.1094	0.16063	0.42241
CONSTANT	106.87	37.049	2.8845	0.2866	0.00000E+00	4.9675

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 13.881 WITH 9 D.F.

No regression run on Coll (1985-1988) modified by PSI.

Regression of Average COLL and Socioeconomic Variables

R-SQUARE = 0.1798 R-SQUARE ADJUSTED = -0.0663
VARIANCE OF THE ESTIMATE = 2.7176
STANDARD ERROR OF THE ESTIMATE = 1.6485
LOG OF THE LIKELIHOOD FUNCTION = -47.7563

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
C1	-0.58831E-01	0.45869E-01	-1.2826	-0.2757	-0.34198	-4.8387
C2	0.44186E-01	0.85838E-01	0.51477	0.1144	0.12643	2.2445
C3	-0.68455E-01	0.96894E-01	-0.70649	-0.1560	-0.17946	-1.3352
C4	0.19681E-03	0.16204E-03	1.2145	0.2621	0.33129	3.6524
C5	0.29165E-01	0.46929E-01	0.62147	0.1376	0.17067	0.69952
C6	0.16019E-01	0.65757E-01	0.24361	0.0544	0.58418E-01	1.7327
CONSTANT	-0.96733	7.4822	-0.12928	-0.0289	0.00000E+00	-1.1551

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 5.096 WITH 6 D.F.

Regression of COLL (1988) and Parent Variables

R-SQUARE = 0.1699 R-SQUARE ADJUSTED = 0.0316
VARIANCE OF THE ESTIMATE = 175.38
STANDARD ERROR OF THE ESTIMATE = 13.243
LOG OF THE LIKELIHOOD FUNCTION = -85.8457

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
P1	0.42700E-01	0.12711	0.33593	0.0789	0.84866E-01	0.30666E-01
P2	6.2490	4.4152	1.4153	0.3165	0.35259	1.4625
P3	-0.40233	0.70741	-0.56874	-0.1329	-0.12818	-0.31892
CONSTANT	-3.9107	23.228	-0.16836	-0.0397	0.00000E+00	-0.17420

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 0.658 WITH 3 D.F.

DROP (Y11)

Regression of Average DROP (Y11)

R-SQUARE = 0.1832 R-SQUARE ADJUSTED = 0.1082
VARIANCE OF THE ESTIMATE = 5.1458
STANDARD ERROR OF THE ESTIMATE = 2.2684
LOG OF THE LIKELIHOOD FUNCTION = -236.460

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
E1	0.80652	0.26045	3.0966	0.2985	0.75919	3.9542
E2	0.11609E-02	0.10888E-02	1.0662	0.1071	0.23242	1.0068
E3	0.10318E-02	0.66978E-03	1.5405	0.1538	0.17729	0.32892
E7	0.41035E-01	0.15443E-01	2.6571	0.2592	0.28980	0.64934E-01
E8	-0.14196E-02	0.31208E-02	-0.45488	-0.0459	-0.58370E-01	-0.11026
E9	-0.37973E-02	0.47139E-02	-0.80556	-0.0811	-0.12033	-0.93408E-01
E10	0.58325E-02	0.40523E-02	1.4393	0.1439	0.20735	0.34790
E11	0.41794E-02	0.18771E-02	2.2265	0.2194	0.35460	1.0647
E12	-0.10867E-02	0.15324E-02	-0.70916	-0.0715	-0.10268	-0.36533
CONSTANT	-12.919	5.4527	-2.3693	-0.2328	0.00000E+00	-5.1984

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 27.907 WITH 9 D.F.

No regression run on Average DROP (1985-1988) Modified by PSI.

Regression of Average DROP and Socioeconomic Variables

R-SQUARE = 0.2474 R-SQUARE ADJUSTED = 0.0216
VARIANCE OF THE ESTIMATE = 4.4107
STANDARD ERROR OF THE ESTIMATE = 2.1002
LOG OF THE LIKELIHOOD FUNCTION = -54.2944

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
C1	-0.71757E-01	0.58436E-01	-1.2279	-0.2648	-0.31362	-5.8500
C2	0.24205E-01	0.10936	0.22134	0.0494	0.52075E-01	1.2187
C3	0.19452	0.12344	1.5758	0.3323	0.38343	3.7608
C4	0.33875E-03	0.20644E-03	1.6409	0.3445	0.42875	6.2315
C5	0.94039E-01	0.59787E-01	1.5729	0.3318	0.41377	2.2357
C6	-0.34497E-01	0.83774E-01	-0.41179	-0.0917	-0.94589E-01	-3.6985
CONSTANT	-2.4485	9.5322	-0.25686	-0.0573	0.00000E+00	-2.8982

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 7.449 WITH 6 D.F.

Regression of Average DROP (1988) and Parent Variables

R-SQUARE = 0.0694 R-SQUARE ADJUSTED = -0.0857
VARIANCE OF THE ESTIMATE = 5.1951
STANDARD ERROR OF THE ESTIMATE = 2.2793
LOG OF THE LIKELIHOOD FUNCTION = -47.1343

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 20 DF	PARTIAL CORR.	STANDARDIZED COEFFFICIENT	ELASTICITY AT MEANS
P1	-0.80206E-03	0.21877E-01	-0.36662E-01	-0.0086	-0.98066E-02	-0.55241E-02
P2	0.16492	0.75991	0.21703	0.0511	0.57246E-01	0.37015
P3	0.12749	0.12175	1.0471	0.2396	0.24986	0.96918
CONSTANT	-0.78140	3.9979	-0.19546	-0.0460	0.00000E00	-0.33380

HETEROSCEDASTICITY TEST
E**2 ON X (B-P-G) TEST: CHI-SQUARE = 3.382 WITH 3 D.F.